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Buecker

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[54] **SHEET METAL BEAM**

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[73] Assignee: **Buecker Machine & Iron Works, Inc.**, Newport, Ky.

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[51] **Int. Cl.**^{7} **E04C 3/07**

[52] **U.S. Cl.** **52/729.5**; 52/729.1; 52/729.2; 52/731.2; 52/732.1; 52/737.1; 52/737.6; 29/897.35

[58] **Field of Search** 52/729.1, 729.2, 52/729.5, 634, 636, 731.2, 731.3, 731.4, 732.1, 732.2, 732.3, 733.2, 737.1, 737.6; 29/897.31, 897.35

[56] **References Cited**

U.S. PATENT DOCUMENTS

132,087	10/1872	Latrobe	52/731.2
D. 291,832	9/1987	Lundstrom	D25/122
639,961	12/1899	De Man .	
774,484	11/1904	Lufkin .	
854,391	5/1907	Voshardt	52/729.3
991,603	5/1911	Brooks	52/729.5 X
1,351,615	8/1920	Brown et al. .	
1,357,073	10/1920	Mooney .	
1,407,242	2/1922	Wylie	52/729.5 X
1,924,880	8/1933	Ragsdale .	
2,049,926	8/1936	Rafter .	
2,303,631	12/1942	Grant .	
2,508,032	5/1950	Kennedy	52/729.5 X
2,774,386	12/1956	Formenti	52/731.2 X
3,066,772	12/1962	Gibson .	
3,079,649	3/1963	Willatts	52/731.2 X
3,214,875	11/1965	Slowinski et al. .	
3,256,670	6/1966	Tersigni	52/634
3,288,489	11/1966	Jahn .	
3,328,931	7/1967	Smith .	
3,342,007	9/1967	Merson	52/729.5
3,491,853	1/1970	Stillman, Jr. .	
3,492,772	2/1970	Bergman .	
3,670,555	6/1972	Fredericks	29/897.35 X

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

494796	3/1930	Germany	52/729.2
580943	7/1933	Germany	52/729.5
2459421	6/1976	Germany	52/729.5
872690	10/1981	U.S.S.R.	52/737.1
128663	7/1919	United Kingdom	52/731.2
2093886	9/1982	United Kingdom	52/729.5
2247033	2/1992	United Kingdom	52/634

OTHER PUBLICATIONS

Modern Trade Communications Inc., *Metal Home Digest,* Mar.–Apr. 1996; Cover, Table of Contents, and pp. 10,14.

Clark Cincinnati Steel Framing Systems, *Steel Framing Systems for the Construction Industry,* no date, 6 pages.

Light Beam Inc., Light Beam System Catalog for Light Beam Header, no date, pp. 1–11.

Light Beam Inc., Light Beam System Catalog for Light Beam Header, no date, pp. 1–7.

U.S. Steel Group, Advertisement for Steel Framing, no date.

Trus Joist Corporation, Advertisement for TJI Joists, no date, 2 pages.

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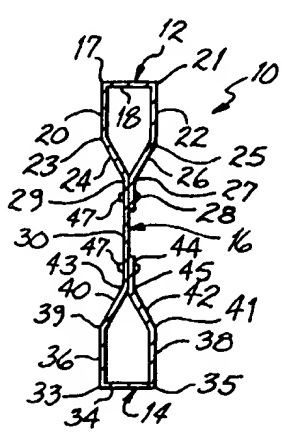
[57] **ABSTRACT**

A building beam structure having two sheet metal chords and a sheet metal central web section disposed between the two chords. Each chord has an end wall with two opposed side walls extending therefrom and two angular support walls extending from the side walls. The angular support walls converge inwardly from the side walls toward the central web section. The central web section has a main web wall extending between one of the angular support walls on each of the chords. In addition, the central web section has a first web wall section extending from another of the angular support walls on one of the chords, and a second web wall section extending from another of the angular support walls on another of the chords.

28 Claims, 4 Drawing Sheets



U.S. PATENT DOCUMENTS

3,698,224	10/1972	Saytes	29/897.35
3,722,167	3/1973	Rousey .	
3,846,031	11/1974	Adams .	
3,928,950	12/1975	Beynon .	
4,069,638	1/1978	Hasselqvist et al. .	
4,257,206	3/1981	Mieyal .	
4,490,958	1/1985	Lowe	52/729.5 X
4,549,383	10/1985	Vukmanic et al. .	
5,022,211	6/1991	Scott	52/729.4 X
5,464,302	11/1995	Menchetti	52/731.2 X
5,535,569	7/1996	Seccombe et al.	52/634
5,553,437	9/1996	Navon	52/729.1
5,842,318	12/1998	Bass et al.	52/653.1

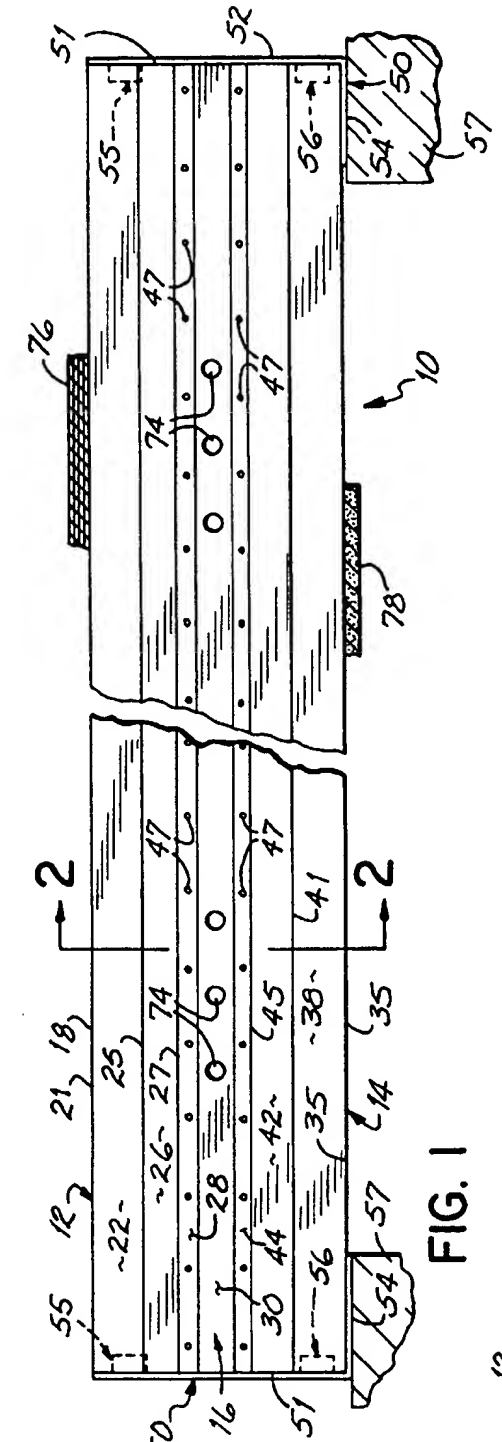


FIG. 1

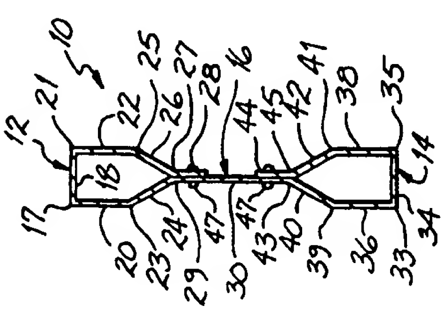


FIG. 2

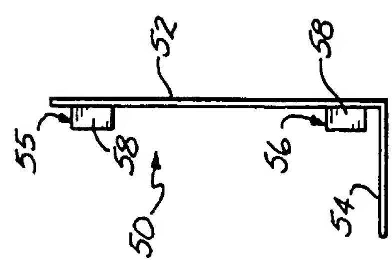


FIG. 3

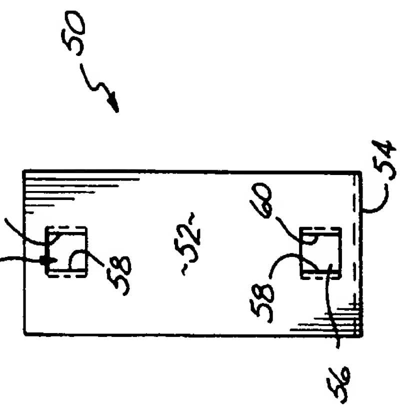


FIG. 4

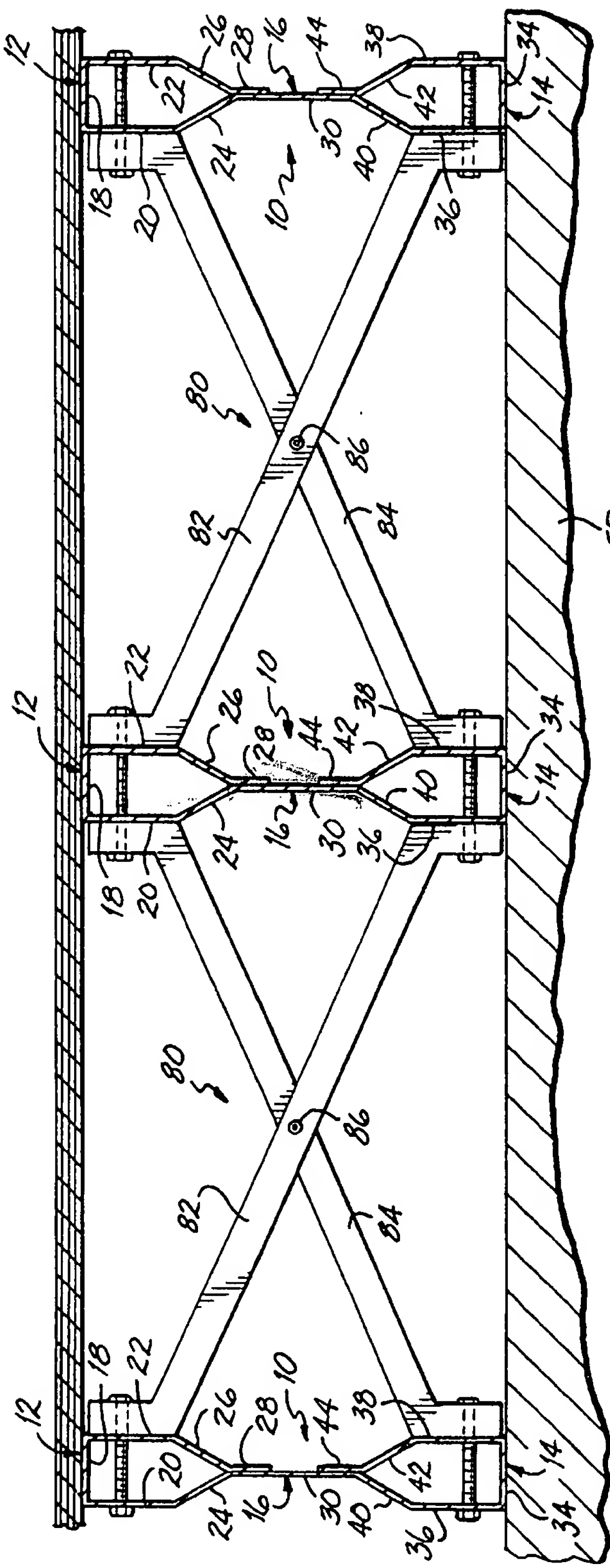


FIG. 5

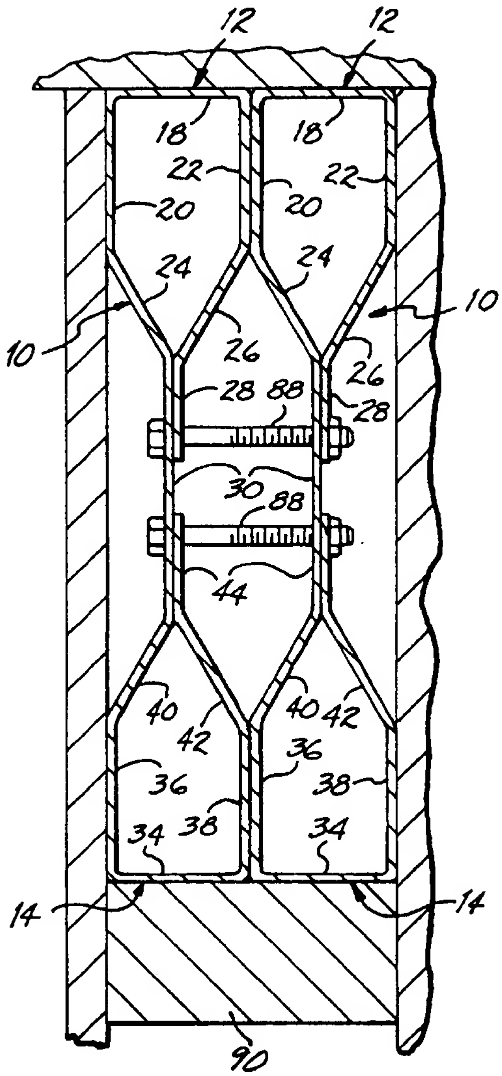

12
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FIG. 6

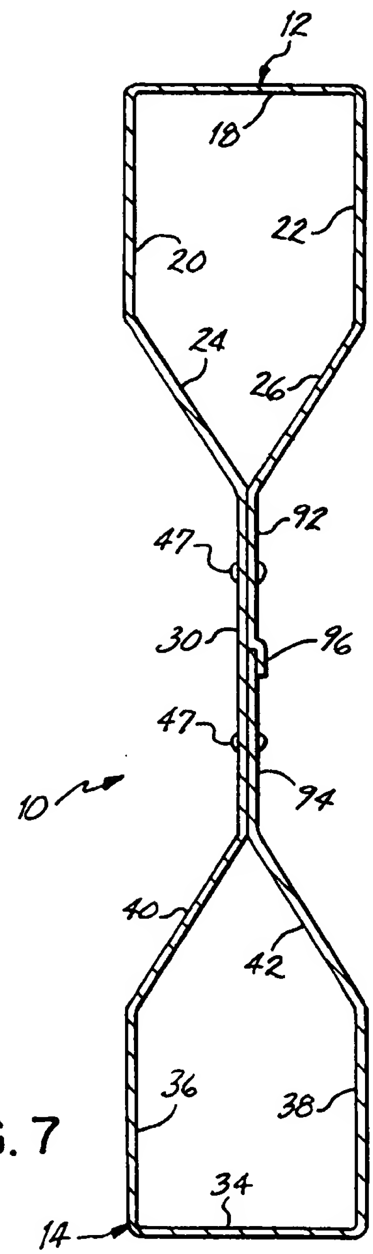
12
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FIG. 7

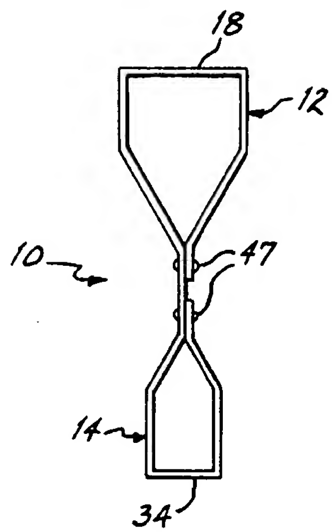


FIG. 8

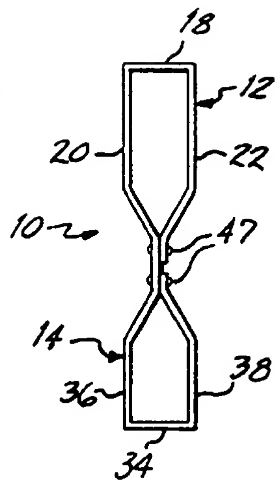


FIG. 9

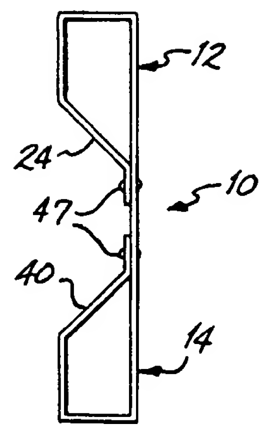


FIG. 10

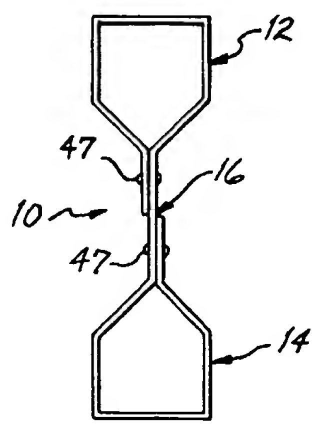


FIG. 11

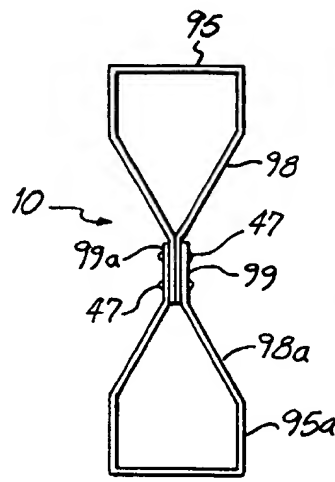


FIG. 12a

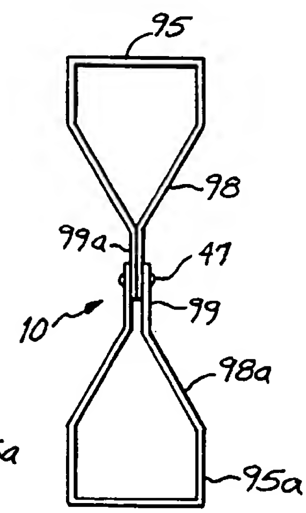


FIG. 12b

SHEET METAL BEAM

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a continuation application corresponding to provisional application Ser. No. 60/073,871, entitled "Sheet Metal Beam", filed on Feb. 4, 1998.

BACKGROUND OF THE INVENTION

This invention relates to construction materials and more particularly, to a new structural member.

Over the years, there have been several attempts to develop alternative construction materials to wood joists, rafters and studs. Even though the problems associated with wood, as a raw material, continue to increase in residential construction, wood remains the dominant structural material.

As world population and economic development increase, the demand for wood also increases, thereby placing significant pressures on our natural resources and other supplies of wood stock. The net result is a general increase in the price of wood. In addition, wood stock, as with other resources, experiences spot variations in price as a function of spot shortages caused by weather, transportation problems and other variables. Further, over the last several decades, the overall quality of wood stock has generally declined. The quality and price issues are even more dramatic for wood joists, that is, the structural members that extend horizontally between vertical walls and provide a subjacent for a floor or roof above the joist. Joist members are generally nominally, 2 inches thick, are nominally in a range of from six inches to 12 inches wide and are most often, ten feet and more in length. Thus, as the wood resource becomes more scarce, of generally lower quality and more expensive, larger wood structures, such as joists, which require high quality wood to provide the desired straightness over their lengths, are proportionally even more expensive.

In use, often to reduce costs, longer joists, for example, those over twelve feet, are fabricated from shorter pieces which are spliced together. Further, as with all wood products, wood joists are subject to damage from termites and other insects.

Several alternatives to the standard wood joist have been considered. For example, fabricated wood I-beams are commercially available from Trus Joist Corporation of Boise, Id. While such fabricated I-beams have the advantage of being manufactured to any length and having a predictable quality, such fabrications are relatively expensive.

Structural members made of steel are widely used in commercial office construction and are now beginning to be used in residential construction. Typically, steel structural members are used for wall studs to which a wall material, for example, wallboard, is attached. Rafters and ceiling joists are frequently integrated into a truss assembly. Such structural steel products are available from Clark-Cincinnati Steel Framing Systems of Cincinnati, Ohio.

A hybrid metal and wood I-beam structure is commercially available from Light Beam Inc. of Santa Monica, Calif. In this beam structure, a pair of sheet metal plates are clinched together to form an I-beam web section and wood members, for example, nominal 2×4 wood pieces, are attached to the web and form the top and bottom cords or flanges of the I-beam. Such a beam structure is fabricated from two identical sheet metal pieces which are attached with nails or other fasteners to the wood flanges. That structure again has some of the inherent disadvantages of an all wood beam, and has the further disadvantage of a relatively high cost to fabricate the hybrid sheet metal and wood structure.

Further, U.S. Pat. Nos. 3,342,007 and 2,049,926 illustrate different designs for a steel joist. However, in spite of the above, the use of substitutes for a standard wood joist in residential construction has been limited.

Consequently, there is a need for a substitute for the standard wood joist that does not have the limitations and disadvantages of known substitutes and provides a practical, higher quality joist structure for less cost.

SUMMARY OF THE INVENTION

The present invention provides a sheet metal joist that is less expensive, stronger, lighter and easier to use than the traditional wood joist. Further, the sheet metal joist of the present invention can be readily manufactured to any length and provided to a contractor without warpage or twisting. The sheet metal joist of the present invention is long-lasting and not susceptible to termite damage and an effective substitute for a traditional wood joist. The sheet metal joist of the present invention includes attachment walls that provide flat, vertical surfaces to which drywall and other building components may be easily attached using known fasteners. Further, the double-wall web construction of the present invention increases the material in the web plane between the top and bottom load bearing rails, thereby substantially strengthening the joist.

In accordance with the principles of the present invention and in accordance with one embodiment, the present invention provides a building beam structure having two sheet metal rails and a sheet metal central web section disposed between the two rails. Each rail has an end wall with two opposed side walls extending therefrom and two angular support walls extending from the side walls. the angular support walls converge inwardly from the side walls toward the central web section. The central web section has a main web wall extending between one of the angular support walls on each of the rails. In addition, the central web section has a first web wall section extending from another of the angular support walls on one of the rails, and a second web wall section extending from another of the angular support walls on another of the rails.

In one aspect of the invention, the side walls and central web section are substantially perpendicular to the end walls of the rails. In another aspect of the invention, one of the end walls is adapted to receive a load and the other of the end walls is adapted to rest on a surface, thereby supporting the beam and the load. In a further aspect of the invention, the rails and the central web section are made from a single piece of sheet metal.

These and other objects and advantages of the present invention will become more readily apparent during the following detailed description taken in conjunction with the drawings herein.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation view of the sheet metal beam in accordance with the principles of the present invention.

FIG. 2 is a cross-sectional view taken along line 2—2 of FIG. 1.

FIG. 3 is a an end view of an end piece to be used with the sheet metal beam.

FIG. 4 is a front elevation view of the end piece of FIG. 3.

FIG. 5 is a partial cross-sectional view of bridging used with sheet metal joists of the present invention.

FIG. 6 is a cross-sectional view of the sheet metal joists being used as a lintel.

FIGS. 7–12 are cross-sectional views of alternative embodiments of the sheet metal joist in accordance with the principles of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

FIGS. 1 and 2 illustrate a sheet metal joist **10** having a first, upper chord or rail **12** and a second, lower chord or rail **14**. The chords **12, 14** are joined by a connecting intermediate web section **16**. One of the chords, **12, 14** and a connecting portion of the web section **16** may also be considered a beam component. The top chord **12** is shaped to form a polygon, and more specifically, a pentagon. The top chord **12** has a normally horizontal load-bearing upper surface or end wall **18** that extends longitudinally over the full length of the joist **10**. The load-bearing surface **18** has longitudinally extending opposed lateral edges that are contiguous with, and intersect, longitudinally extending upper edges of respective opposed side walls **20, 22** to form respective corners **17, 19**. The two side or fastening walls **20, 22** are generally parallel and generally perpendicular to the load-bearing surface **18** and are normally oriented in the generally vertical direction. The fastening or side walls **20, 22** provide flat fastening surfaces to which materials may be connected in the normal course of construction. The fastening walls **20, 22** having longitudinally extending lower edges that are contiguous with, and intersect, longitudinally extending upper edges of respective angular support walls **24, 26** to form respective corners **23, 25**. The support walls **24, 26** converge inwardly toward the centrally located web section **16**. The angular support wall **24** has a longitudinally extending lower edge that is contiguous with, and intersects, a longitudinally upper edge of a main web wall **30** to form a bend or corner **29**. The angular support wall **26** has a longitudinally extending lower edge that intersects and is contiguous with a longitudinally upper edge of a first web wall section **28** to form a bend or corner **27**.

The bottom chord **14** is generally the same shape and normally the same size as the top chord **12**. The bottom chord **14** has a normally horizontal lower surface or end wall **34** generally parallel with the opposing end wall **18**. The end wall **34** has longitudinally extending opposed lateral edges that are contiguous with, and intersect, longitudinally extending lower edges of opposed respective side walls **36, 38** to form respective corners **33, 35**. The fastening or side walls **36, 38** are generally parallel and generally perpendicular to the end wall **34**, are normally vertical and provide further flat, fastening surfaces. The fastening walls **36, 38** have longitudinally extending upper edges that are contiguous with and intersect longitudinally extending lower edges of respective angular support walls **40, 42** to form respective bends or corners **39, 41**. The angular support walls **24, 26** converge inwardly toward the centrally located web section **16**. The angular support wall **40** has a longitudinally extending upper edge that is contiguous with and intersects a longitudinally extending lower edge of the main web wall **30** to form a bend or corner **43**. The angular support wall **42** has a longitudinally extending upper edge that is contiguous with and intersects a longitudinally extending lower edge of a second web wall section **44** to form a bend or corner **45**.

The web wall sections **28, 44** are rigidly connected to the main web wall **30** using known fastening devices **47**, for example, rivets, TOG-L-LOCK fasteners, sheet metal screws, bolts, etc. Alternatively, the web wall sections **28, 30, 44** are connected by fastening devices such as adhesives, spot welding, seam welding, and other joining mechanisms known in the art. The application of the fastening devices adds substantial strength and rigidity to the beam structure especially in a direction parallel to a plane of the intermediate web section **16** which is normally the vertical direction. The sheet metal joist of FIGS. **1** and **2** is normally formed by rolling a continuous piece of the sheet metal stock over a plurality of dies. While preferably the joist is made from approximately 20-gauge thick sheet metal, the sheet metal thickness may vary in the range of from approximately 16-gauge to approximately 24-gauge, depending upon the application and the capacity of the roll-forming machine. The heights of the fastening surfaces **20, 22, 36, 38** and the height of the web wall **30** may be varied to vary the nominal size of the joist, for example, from a 2×8 joist to a 2×12 joist. The joists are cut to their desired nominal lengths either before or after the fabrication process.

FIGS. 3 and 4 illustrate an end plate **50** which may be used to terminate the ends **51** of joist **10**. The end plate is preferably L-shaped with a generally vertical nailing plate **52** that intersects a generally horizontal locating plate **54**. As will be appreciated, the plate **54** is optional depending on the application. The nailing plate **52** has centrally located upper and lower flange pairs **55, 56**, respectively. Each flange pair has opposed flanges **58, 60** which are separated to fit adjacent to the fastening walls **20, 22, 36, 38** within the cavities bounded by the walls of the top and bottom chords **12, 14**.

In use, a joist of the desired length is selected and the end plates **50** are mounted at the ends **51** of the joist **10**. The assembly of the joist **10** and end plates **50** is positioned at its desired general location. The width of the locating plates **54** of the end plates **50** are more than twice the nominal width of the joist **10**; and therefore, the locating plates **54** stabilize the joist **10** in its desired generally vertical orientation. The lower end wall **34** of the joist **10** is normally positioned on top of a structural element **57**, for example, foundation walls, metal I-beams or metal or wood stud walls. When the joist **10** is located in its desired position, it may be secured in that position by applying nails or other fasteners through the nailing plates **52** or the locating plates **54**.

Sub-flooring **76** is attached to the upper load-bearing surfaces of end walls **18** by known fasteners, and drywall or other ceiling material **78** is attached to the lower surfaces **34** by known means. After the joist is secured in place, plumbing and electrical utilities are then installed. The joist **10** is normally manufactured with holes **74** that extend through the web section **16**; and the holes **74** are sized to receive pipes and/or wires, thereby facilitating the installation of the plumbing and electric utilities. The holes **74** may be made as part of the joist fabrication or made on-site in the field.

As illustrated in FIG. **5**, bridging **80** may be installed between the joists **10**. Bridging is normally fabricated to provide an X-shaped structure having two legs **82, 84**. Leg **82** has one end connected to the top chord **12** of a first joist and has the opposite end connected to a bottom chord **14** of an adjacent joist. The leg **84** is connected at one end to the bottom chord **14** of the first joist and is connected at its opposite end to the top chord **12** of the adjacent joist. For increased strength, the bridging legs **82, 84** are connected together with a fastener **86**. In a totally metal construction, the bridging legs **82, 84** may be formed from metal tubing

that is 16-gauge and nominally 0.625 inch or 0.75 inch across. Either square or round tubing may be used. While two bridging legs **82**, **84** are illustrated in FIG. **5**, bridging with a single leg will provide more strength than no bridging, but provides less strength than the full cross-bridging illustrated in FIG. **5**. The bridging legs **82**, **84** may also be made from materials other than metal, for example, wood.

While the sheet metal joists may be used to support floors and ceilings as illustrated in FIG. **1**, they may also be used to provide a header or lintel above a window or door. As illustrated in FIG. **6**, two sheet metal joists **10** are connected together by fasteners **88** extending it through the web walls **30** of the joists **10**. The joists **10** are located immediately above a window frame section **90** and function to support the structure located above the window or door.

FIG. **7** illustrates an alternative embodiment of the joist **10** with respect to the web wall **16**. The web wall **16** contains a continuous web wall portion **30** as described with respect to FIG. **2**. However, the angular support walls **26**, **42** intersect web wall portions **92**, **94** that extend over the full length of the web wall **30**, and in addition, have an overlapping portion **96**. In the alternative embodiment, the web wall portions **30**, **92**, and **94** are joined together by fasteners **47** as previously described with respect to FIG. **1**. Depending on the length of the overlapping section **96**, fasteners may be applied through the section **96**. Alternatively, the section **96** may be welded or not connected at all.

The sheet metal joist heretofore described provides a substitute for a traditional wood joist that is stronger, lighter, competitively prices and easier to use than the traditional wood joist. Further, the sheet metal joist can be readily manufactured to any length and provided to the contractor without warpage or twisting. In addition, the sheet metal joists are long-lasting and not susceptible to termite damage.

The sheet metal joist includes attachment side walls **20**, **22**, **36**, **38** that provide flat, vertical surfaces to which drywall and other building components may be easily attached using known fasteners. Further, the double-wall construction of the web **16** increases the material in the plane between the top and bottom chords, thereby substantially strengthening the joist.

While the invention has been illustrated by the description of one embodiment and while the embodiment has been described in considerable detail, there is no intention to restrict nor in any way limit the scope of the appended claims to such detail. Additional advantages and modifications will readily appear to those who are skilled in the art. For example, the sheet metal joists can be designed to have different strengths by using different carbon steel sheet metals or an alloy, as well as varying the gauge of the sheet metal.

Further, the basic configuration of the building sheet metal beam structure can be modified as illustrated in FIGS. **8**–**12** for different applications and/or to satisfy different manufacturing requirements and specifications. For example, as shown in FIG. **8**, the widths of the end walls **18**, **34** of the respective upper and lower chords **12**, **14** can be different; and as shown in FIG. **9**, the height of the side walls **20**, **22** of the upper chord **12** can be substantially different from the height of the side walls **36**, **38** of the lower chord **14**. FIGS. **8** and **9** further demonstrate that the ratio of the width of the chord to its height can be varied to suit a particular application.

FIG. **10** is a further embodiment in which only one angular support wall **24**, **40** is used with each of the respective upper and lower chords **12** and **14**. FIG. **11** illustrates another embodiment of the beam in which the upper and lower chords **12**, **14** are folded in the same direction, for example, counterclockwise, from the central web section **16**. In contrast with the other embodiments, the upper and lower chords fold in opposite directions. For example, referring to FIG. **8**, in moving from the web section, the upper chord **12** folds in a clockwise direction; and the lower chord **14** folds in a counterclockwise direction.

FIGS. **12*a*** and **12*b*** illustrate an embodiment in which the beam structure is made from two beam components **95**, **95*a***. Each component has a chord section **98**, **98*a*** and a web wall section **99**, **99*a***. The beam components **95**, **95*a*** are positioned with respect to each other such that the web wall sections overlap, and the overlapping web wall sections are joined by the fastening devices **47**, for example, rivets, bolts, spot welds, electric welds, adhesives, etc. As shown in FIG. **12*b***, the components **95**, **95*a*** can be connected together at different relative positions, thereby permitting the beam **10** to be fabricated to different nominal heights. Further, if there is some variation in the manufacture of the components **95**, **95*a***, the components can be fixtured and fastened together to achieve a beam having a highly uniform height over its length. In addition, as will be appreciated, the pairs of web wall sections may be of different lengths, so that a shorter web wall section of each component is joined to longer web wall sections of the two components.

While the normal application of the sheet metal beam of the present invention is intended to be in residential building construction, the sheet metal beam can be used in garages and other utility buildings, in commercial buildings, in barns, sheds and other farm buildings, landscaping structures, in bridges, as concrete reinforcement in roads and other infrastructure construction.

Therefore, the invention in its broadest aspects is not limited to the specific details shown and described. Consequently, departures may be made from the details described herein without departing from the spirit and scope of the claims which follow.

What is claimed is:

1. A building beam structure comprising:

two sheet metal chords, each of the chords having
  - a flat end wall,
  - two opposed side walls extending from the end wall and having respective flat fastening surfaces to which materials may be connected, and
  - two angular support walls, each of the angular support walls extending from one of the side walls, and the angular support walls converging inwardly from the side walls; and

a sheet metal central web section disposed between the two chords and including
  - a planar main web wall extending straight between one of the angular support walls on each of the chords,
  - a first web wall section extending from another of the angular support walls on one of the chords, and
  - a second web wall section extending from another of the angular support walls on another of the chords.

2. A building beam structure of claim 1 further comprising fastening devices connecting the first and second web wall sections with the main web wall.

3. A building beam structure of claim 1 wherein the two sheet metal chords and the sheet metal central web section are made from a single piece of sheet metal.

4. A building beam structure of claim 1 wherein the two sheet metal chords and sheet metal central web section are

made from a single piece of sheet metal having a thickness in the range of from approximately 16-gauge to approximately 24-gauge.

5. A building beam structure of claim 1 wherein the two sheet metal chords and sheet metal central web section are made from a single piece of approximately 20 gage sheet metal.

6. A building beam structure of claim 1 wherein the end wall of one chord is substantially parallel to the end wall of the other chord.

7. A building beam structure of claim 1 wherein the side walls are substantially perpendicular to each end wall.

8. A building beam structure of claim 1 wherein the central web section is substantially perpendicular to each end wall and substantially parallel to the side walls.

9. A building beam structure of claim 1 wherein each end wall is disposed in a generally horizontal direction and the central web section is disposed in a generally vertical direction.

10. A building beam structure of claim 1 wherein each end wall on each of the chords has two opposed longitudinal lateral edges.

11. A building beam structure of claim 10 wherein each of the two side walls on each of the chords has first and second longitudinal edges with the first longitudinal edge of each of the side walls being connected to one of the longitudinal lateral edges of one of the end walls.

12. A building beam structure of claim 11 wherein each of the two angular support walls on each of the chords has first and second longitudinal edges with the first longitudinal edge of each of the angular support walls being connected to the second longitudinal edge of one of the side walls.

13. A building beam structure of claim 12 wherein the main web wall of the central web section further comprises two longitudinal edges with one of the longitudinal edges being connected to the second longitudinal edge of one of the angular support walls on one of the chords and the other of the longitudinal edges being connected to the second longitudinal edge of one of the angular support walls on the other of the chords.

14. A building beam structure of claim 13 wherein the first web wall section of the central web section further comprises a longitudinal edge connected to the second longitudinal edge of the other of the angular support walls on one of the chords.

15. A building beam structure of claim 14 wherein the second web wall section of the central web section further comprises a longitudinal edge connected to the second longitudinal edge of the other of the angular support walls on the other of the chords.

16. A building beam structure of claim 1 further comprising a plurality of holes spaced longitudinally along the central web section and sized to receive apparatus for utilities.

17. A building beam structure of claim 1 wherein one of the side walls of one chord is coplanar with one of the side walls of the other chord, and the other of the side walls of the one chord is coplanar with the other of the side walls of the other chord.

18. A building beam structure comprising:

upper and lower sheet metal chords, each of the chords having

a flat end wall,

two opposed side walls extending from the end wall and having respective flat fastening surfaces to which materials may be connected, and

two angular support walls, each of the angular support walls extending from one of the side walls, and the angular support walls converging inwardly from the side walls;

sheet metal planar web walls extending from the angular support walls intermediate the upper and lower chords; and

fastening devices connecting the web walls together, thereby providing a sheet metal beam structure having upper and lower chords and an intermediate web.

19. A building beam structure of claim 18 wherein the web walls further comprise

a main web wall extending between one of the angular support walls on each of the upper and lower chords,

a first web wall section extending from another of the angular support walls on the upper chord, and

a second web wall section extending from another of the angular support walls on the lower chord, the fastening devices connecting the first and second web wall sections with the main web wall.

20. A building beam structure of claim 18 wherein the web walls further comprise

a first pair of web wall sections, each of the first pair of web wall sections extending from one of the angular support walls on the upper chord,

a second pair of web wall sections each of the second pair of web wall sections extending from one of the angular support walls on the lower chord.

21. A building joist structure comprising:

first and second sheet metal chords, each of the chords having

a flat end wall with opposed longitudinal lateral edges,

two generally parallel side walls, each of the side walls having

a longitudinal first edge extending from one of the longitudinal lateral edges of the end wall,

a longitudinal second edge, and

a flat fastening surface between the first and second longitudinal edges of the side wall to which materials may be connected,

two angular support walls converging inwardly from the side walls, each of the support walls having

a longitudinal first edge extending from the longitudinal second edge of the side wall, and

a longitudinal second edge;

a sheet metal central web section connected between the two chords and including

a planar main web wall having

a longitudinal first edge extending from the longitudinal second edge of the one of the support walls on the first chord, and

a longitudinal second edge extending from the longitudinal second edge of one of the support walls on the second chord, and

a first web wall section having a longitudinal first edge extending from the longitudinal second edge of another of the support walls on the first chord, and

a second web wall section having a longitudinal first edge extending from the longitudinal second edge of another of the support walls on the second chord, the first and second web wall sections extending adjacent the main web wall; and

fastening devices connecting the first and second web wall sections with the main web wall.

22. A building joist structure comprising:

a single sheet metal piece having upper and lower opposed chords connected by a generally vertical web section;

each of the chords having five walls including

a generally horizontal flat end wall,

two generally vertical side walls connected along upper longitudinal edges to the end wall, the side walls having respective flat fastening surfaces to which materials may be connected, and

two angular support walls connected along upper longitudinal edges to lower longitudinal edges of the vertical side walls, the angular support walls converging inward from the vertical side walls; and

the web section including

a first planar web wall connected to first angular support walls on each of the top and bottom chords,

a second web wall connected to a second angular support wall on the upper chord, and

a third web wall connected to a second angular support wall on the lower chord.

23. A building beam structure of claim 22 further comprising fastening devices connecting the second and third web walls with the first web wall.

24. A building beam structure of claim 23 further comprising a plurality of holes spaced longitudinally along the central web section and sized to receive apparatus for utilities.

25. A building beam structure of claim 23 wherein one of the side walls of one chord is coplanar with one of the side walls of the other chord, and the other of the side walls of the one chord is coplanar with the other of the side walls of the other chord.

26. A building beam structure comprising:

two sheet metal chords, each of the chords having

a flat end wall,

two opposed side walls extending from the end wall and having respective flat fastening surfaces to which materials may be connected, and

one angular support wall, the angular support wall extending from one of the side walls, and the angular support wall converging inwardly from the side walls; and

a sheet metal central web section disposed between the two chords and including

a main planar web wall extending straight between another of the side walls on each of the chords,

a first web wall section extending from one of the angular support walls on one of the chords, and

a second web wall section extending from one of the angular support walls on another of the chords.

27. A building beam structure of claim 26 further comprising fastening devices connecting the first and second web wall sections with the main web wall.

28. A building beam structure comprising:

two sheet metal beam components, each of the beam components having

a flat end wall,

two opposed side walls extending from the end wall and having respective flat fastening surfaces to which materials may be connected,

two angular support walls, each of the angular support walls extending from one of the side walls, and the angular support walls converging inwardly from the side walls, and

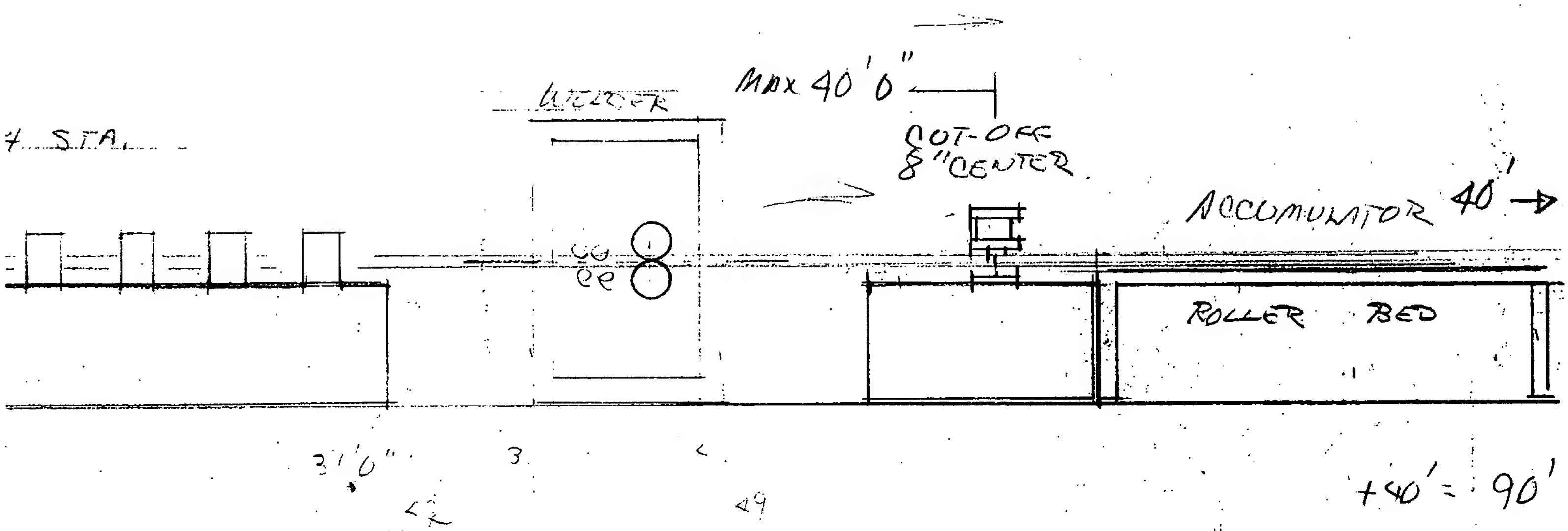
two sheet metal web walls, each of the web walls extending from one of the angular support walls,

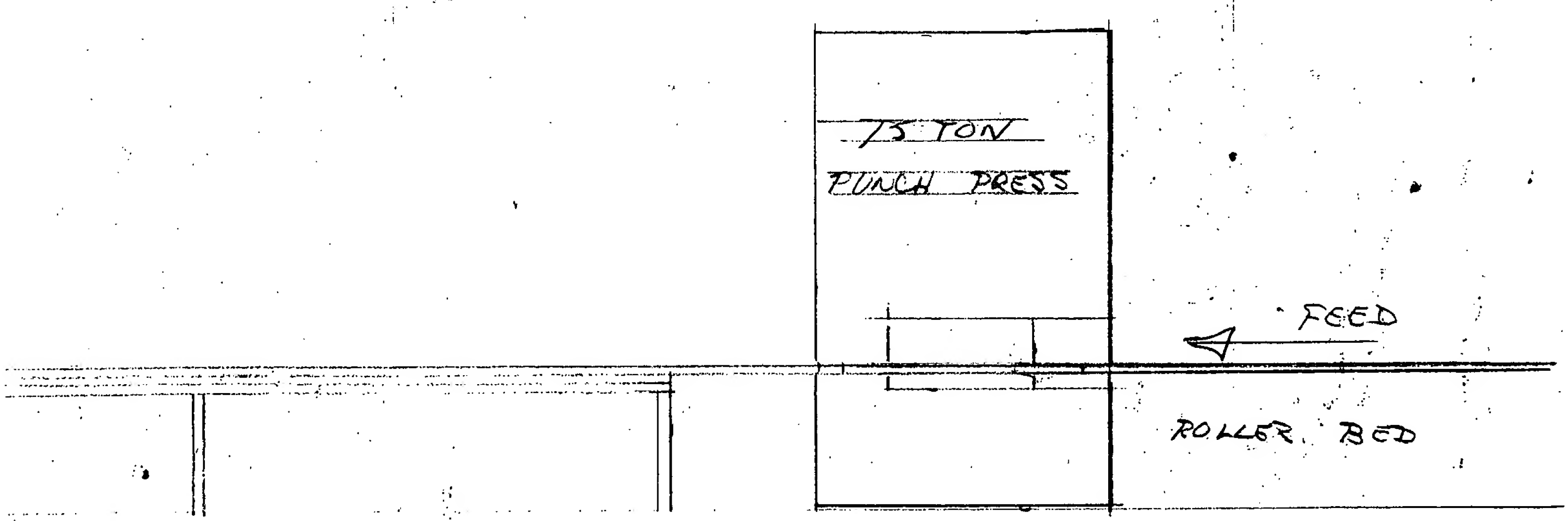
the two beam components being disposed with respect to each other such that the web walls of one of the beam components overlap the web walls of the other of the beam components; and

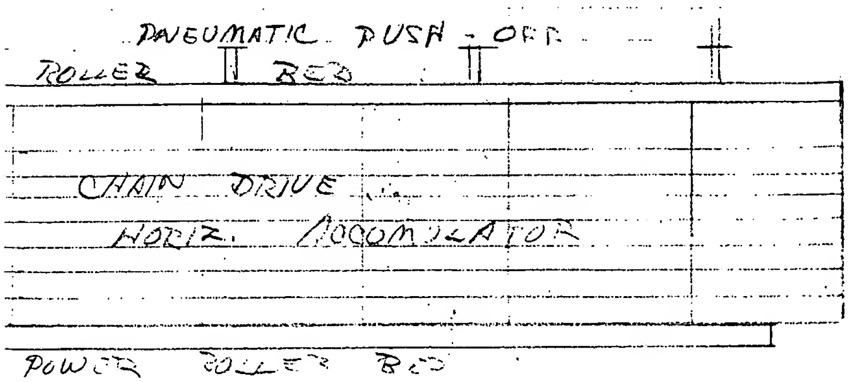
fastening devices connecting the web walls, thereby providing a beam structure having opposed end walls with intermediate and interconnected web walls.

* * * * *

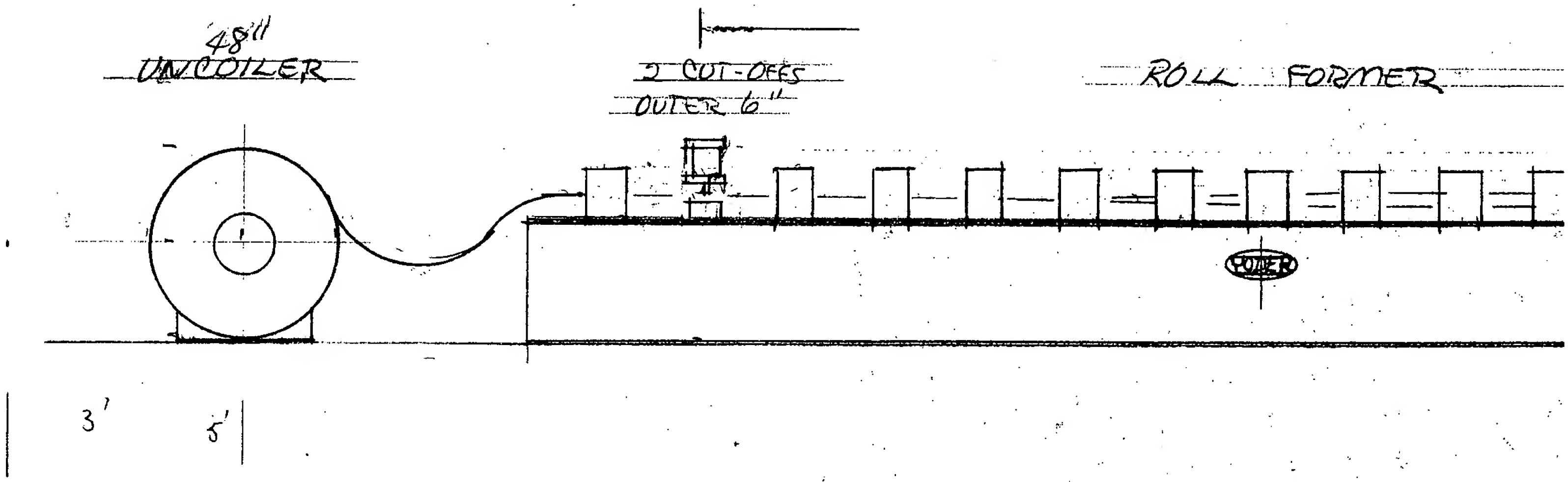
exhibit 1

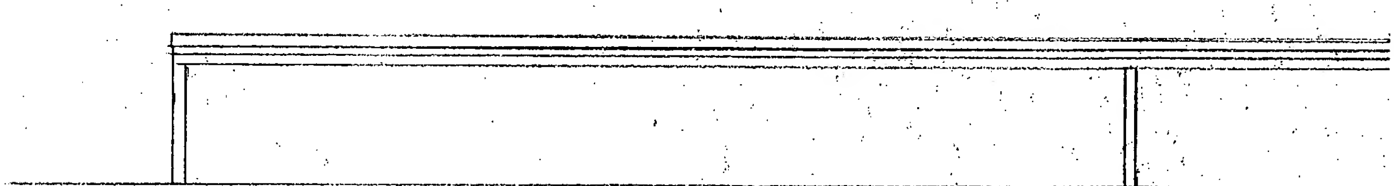

4 STA.
WELDER
MAX 40'0"
CUT-OFF
8" CENTER
ACCUMULATOR 40'
ROLLER BED
3'0"
+40' = 90'


75 TON
PUNCH PRESS
FEED
ROLLER BED


PNEUMATIC PUSH - OFF
ROLLER BED
CHAIN DRIVE
HORIZ. ACCUMULATOR
POWER ROLLER BED

AREA:
100' X 20' ±


48"
UNCOILER
2 CUT-OFFS
OUTER 6"
ROLL FORMER
POWER
3'
5'



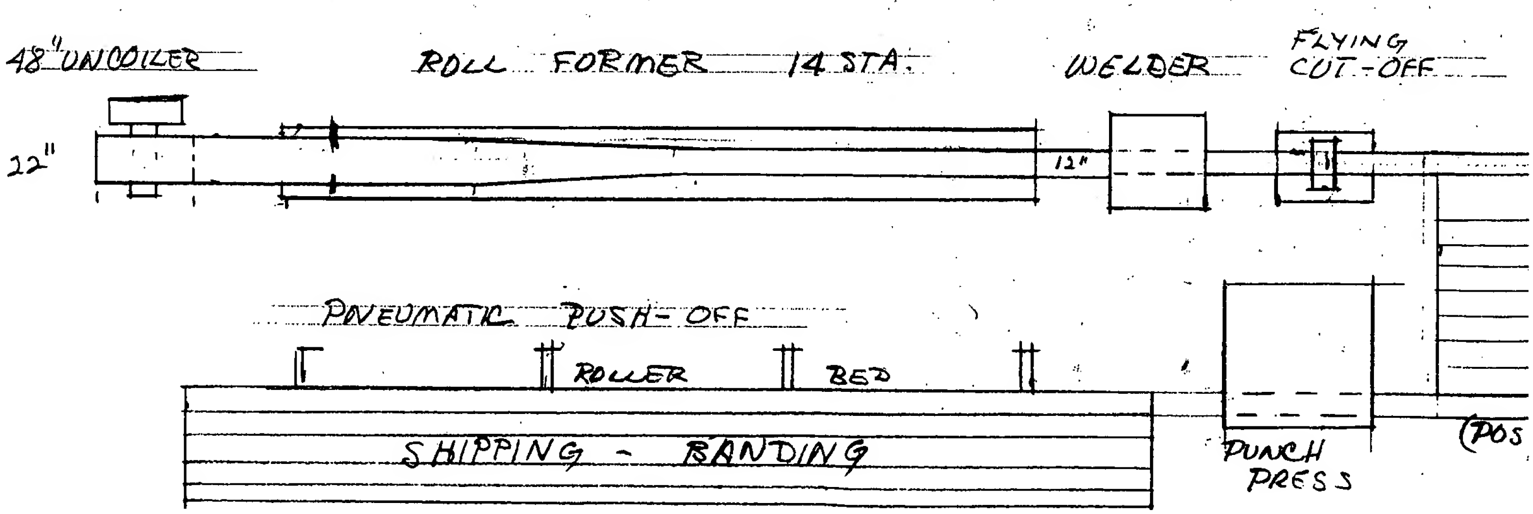

48" UNCOILER
ROLL FORMER 14 STA.
WELDER
FLYING
CUT-OFF
12"
12"
PNEUMATIC PUSH-OFF
ROLLER
BED
SHIPPING - BANDING
PUNCH
PRESS
(POS

exhibit 2

October 27, 1995

AGREEMENT

TRUSSTEEL, Darrell G. Meyer
13269 Soft Cloud Way
Victorville, CA 92392

RE: TRUSSTEEL Open Web Steel Floor Truss

The Undersigned hereby acknowledge the proprietary design rights of Darrell G. Meyer, Inventor, of a certain floor truss assembly incorporating resistance electric welding of "U Channnel" vertical and diagonal webs and rectangular tube members. A prototype of which was tested approximately September 20, 1995.

We will not offer for sale, license or manufacture this product or a like type product without the consent and approval of Darrell G. Meyer.

Sincerely,

ANGELES METAL SYSTEMS
4817 E. Sheila Street
Los Angeles, CA 90040

TRUSSTEEL

Allan MacQuoid, C.E.O.

Darrell G. Meyer

D. Kingston Cable, Chairman

exhibit 3

TO D. KINGSTON CABLE

CASH REQUIRED TO PROCEED W TRUSSTEEL PROTOTYPE & TESTING / 60 DAY

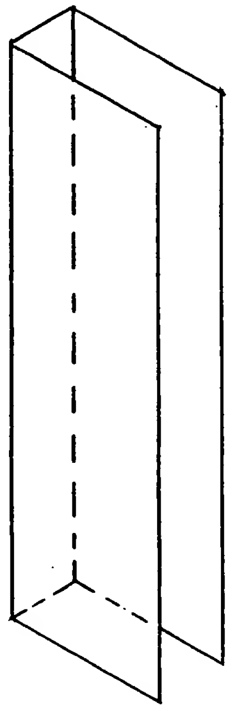
NOV 6 95

D.G. MEYER

	TOTAL	DUE NOV		DEC		JAN
DARRELL G. MEYER	13000 -					
RETAINER - GOOD FAITH		6	5000 -			
SALARY - DRAW			4000 -		4000 -	
METALURGY - WELD CONSULT.	500 -	11	500 -			
$100 HR x 5						
WELDER - CONTROLLER	12500 -					
BID $11,800 + TAX			6000 -			
		11		12	6500 -	
BRIDGE - GANTRY - FESTOONING	3000 -					
BID $2800 + T		20	1500 -			
				10	1500 -	
TRUSS ASSY FIXTURE	6000 -					
VERBAL - ANAHEIM WELD		10	3000 -			
				10	3000 -	
ROLLERS — STANDS	2000 -	10	2000 -			
HYTROL QUOTE						
CHAIN ACCUM. & DOLLIES	4000 -	20				
			2000 -			
				20	2000 -	
INSTALL - LABOR, ELECT, AIR	3000 -					
		20	2000 -			
				20	1000 -	
TOTAL	44000 -					
NOV			26000 -			
DEC					18000 -	

SEE 3 MONTH START-UP FOR ADDITIONAL EXPENSES

2



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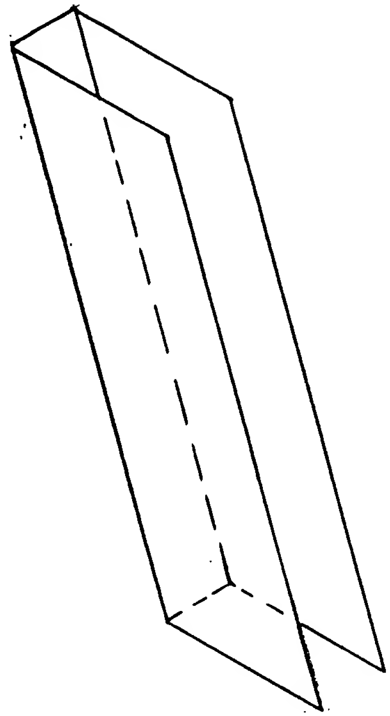

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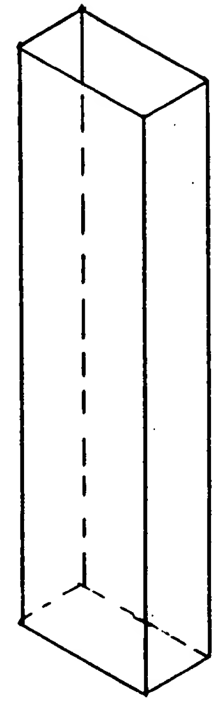

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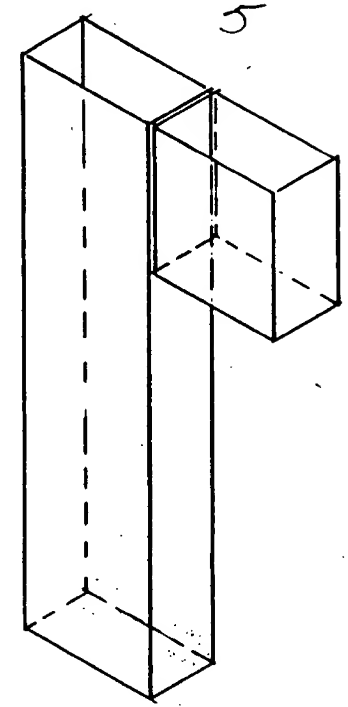
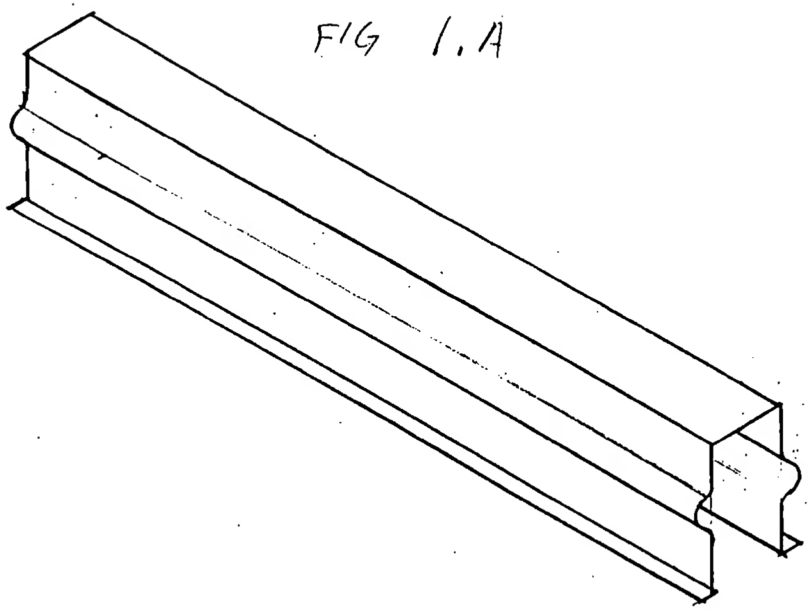
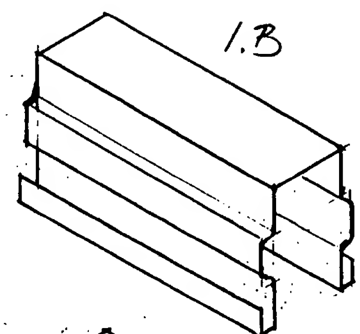


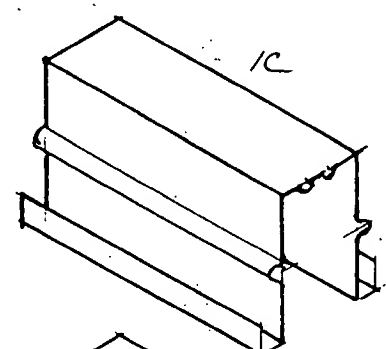
FIG 1.A



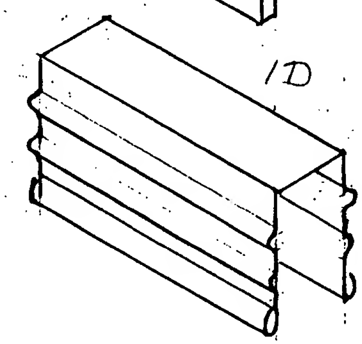
1.B



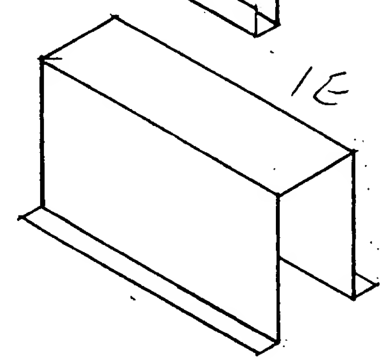
1C

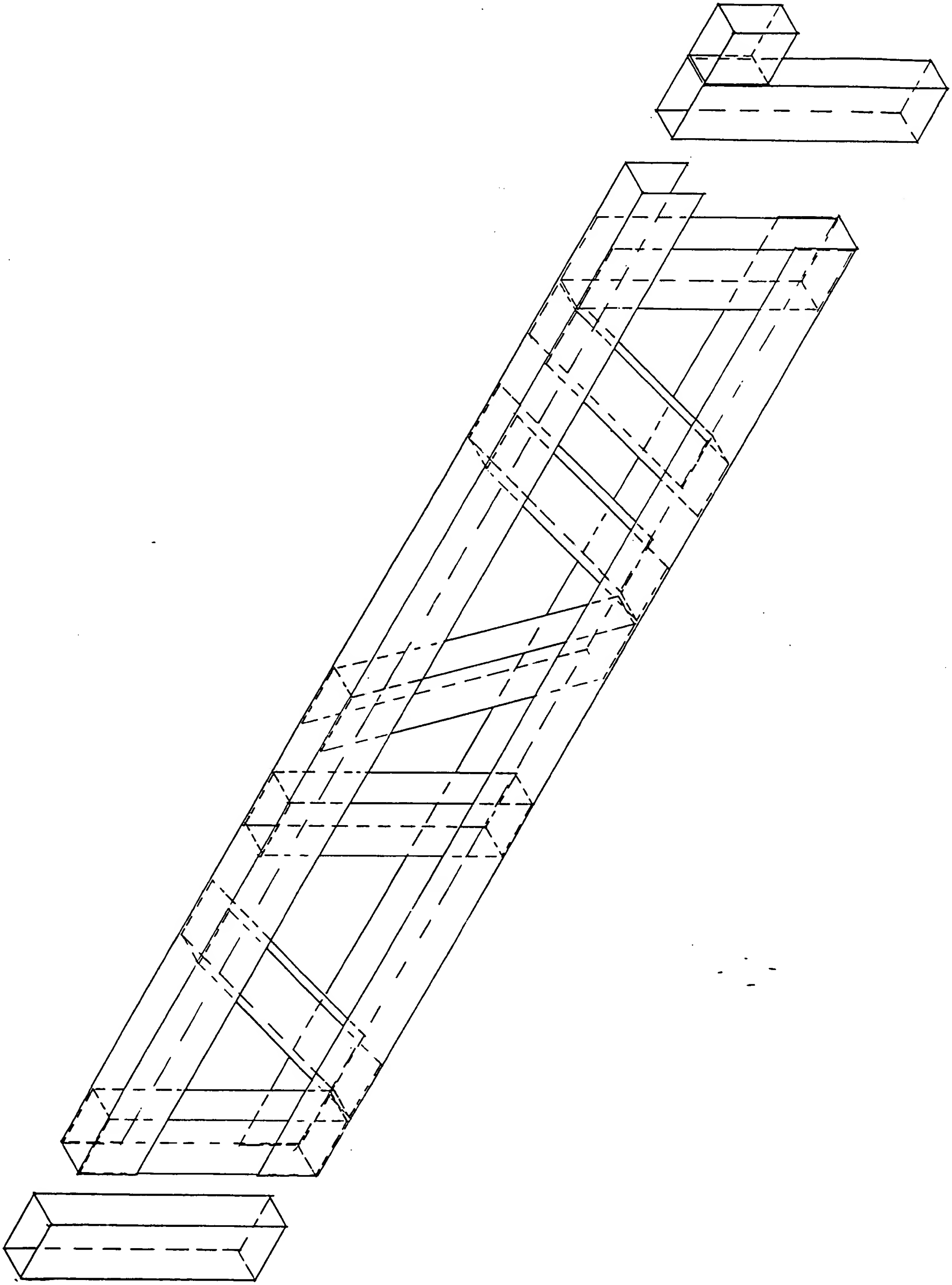


1D



1E





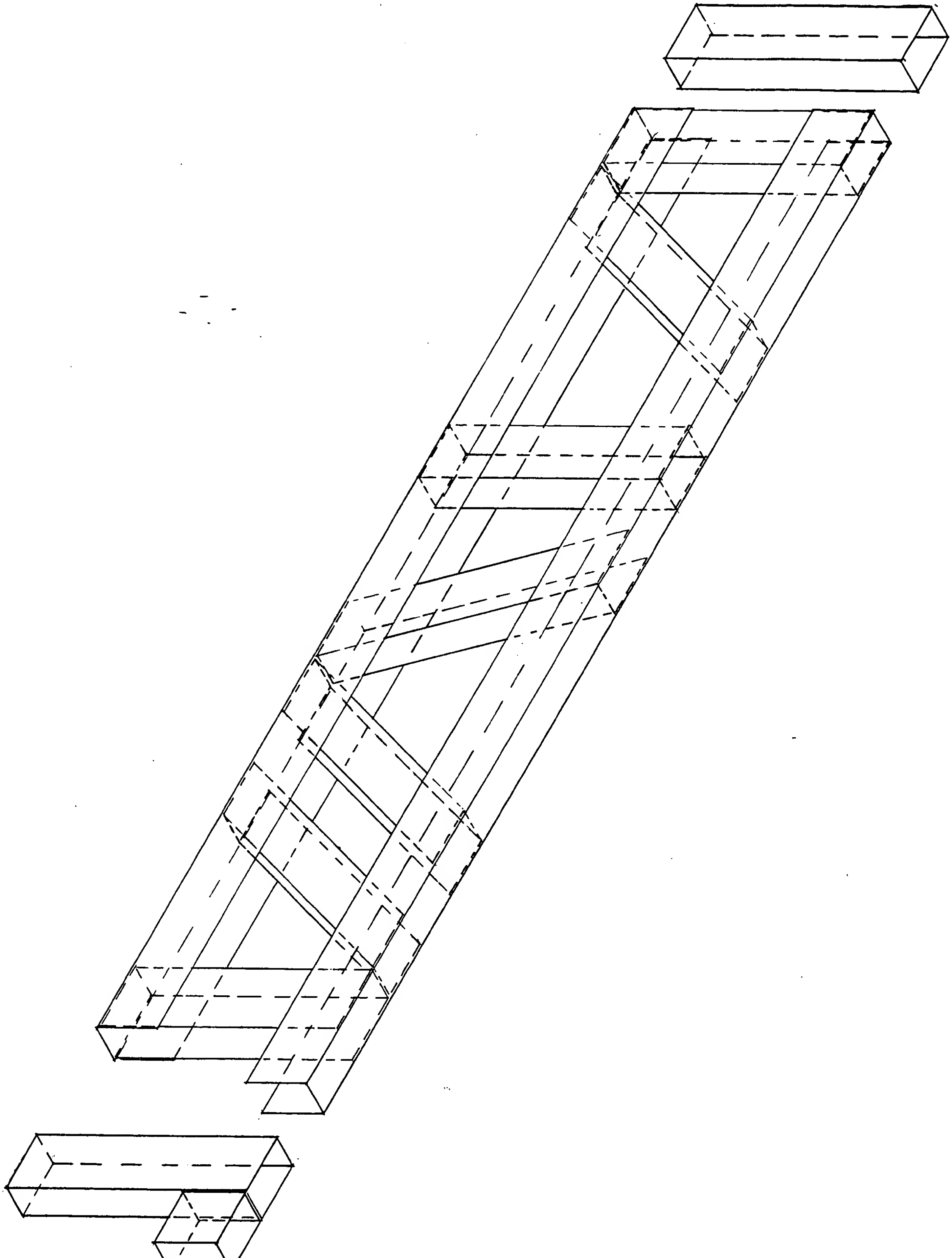
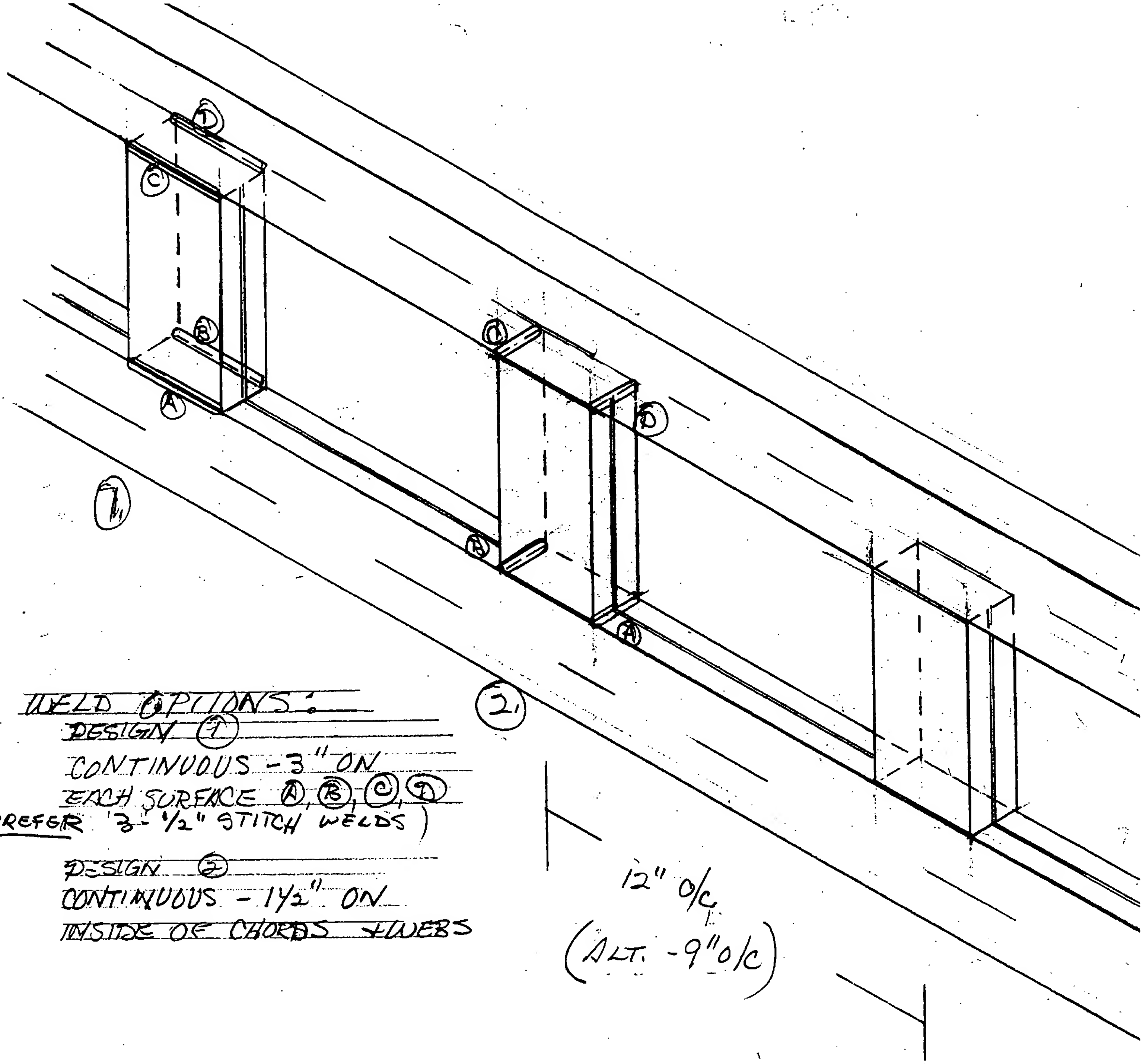


exhibit 4



WELD OPTIONS:
DESIGN 1
CONTINUOUS - 3" ON
EACH SURFACE A, B, C, D
(PREFER 3 - 1/2" STITCH WELDS)

DESIGN 2
CONTINUOUS - 1½" ON
INSIDE OF CHORDS + WEBS

MATERIAL: ZINCALUME COATED STEEL
20 GAUGE .0346 (.035) ROLL FORMED TO TUBE SECTION
ALT: 18 " .045 (.047)
WEB - SAME MTL AS CHORD

CALCULATIONS FOR
1½" x 3" TUBE
18 GA. + 20 GA.
WEBS @ 12" O/C + 9" O/C

* REVISED 12-12-95 G

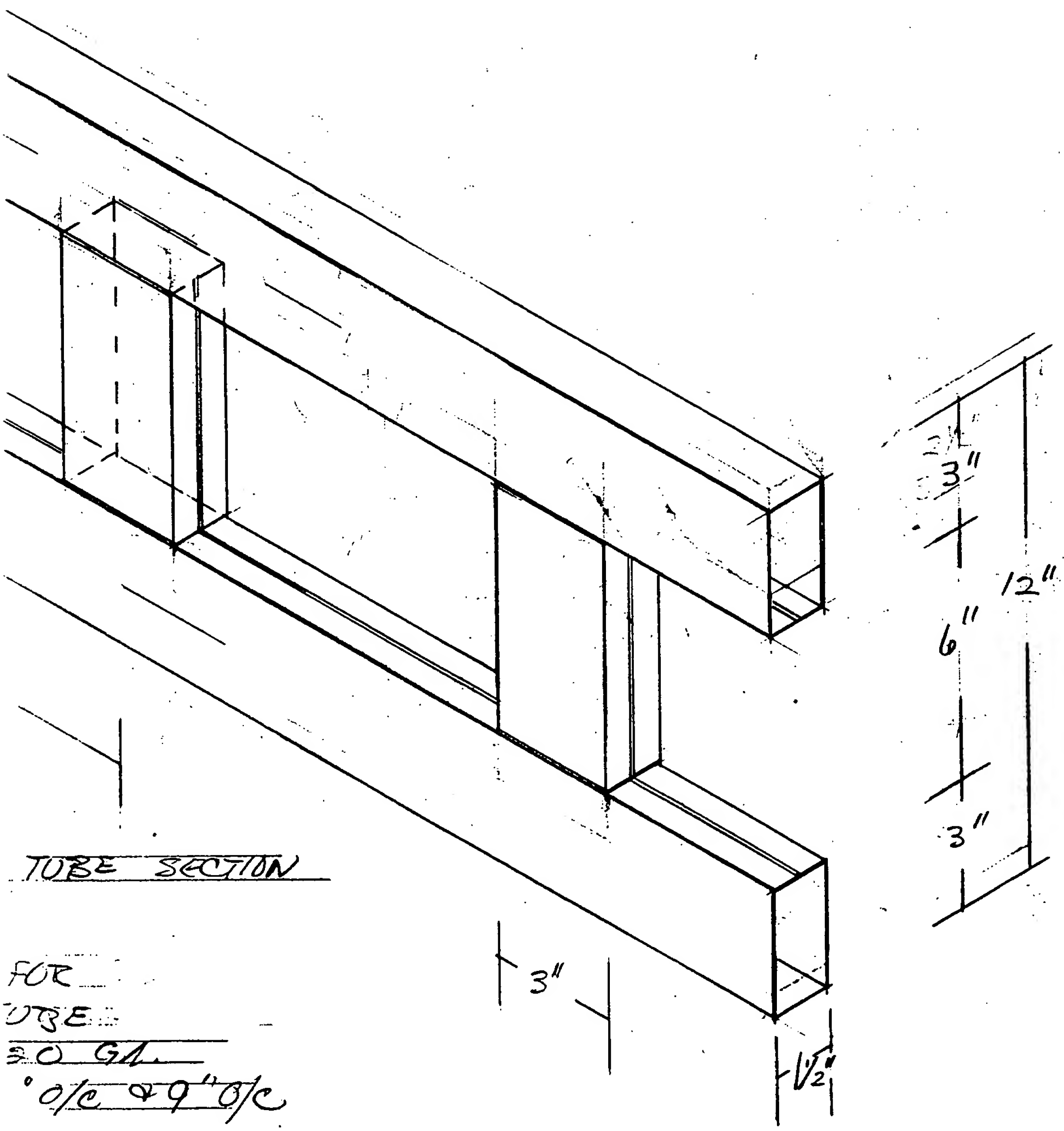
ALL PROPRIETARY RIGHTS RESERVED
DARRELL G. MEYER 11-14-95
619 955-9736

Exhibit 5

FAX 714 752-5321

12-13-95

TO: SAEED AND WEI



TUBE SECTION

FOR

UBE

0 GA.

" O/C & 9" O/C

EVISED 12-12-95

Exhibit 6

AGREEMENT FOR PROFESSIONAL SERVICES

THIS AGREEMENT IS ENTERED INTO THIS 20 TH DAY OF DECEMBER 1995 BY AND BETWEEN DARREL G. MEYER, (AN INDIVIDUAL), HERINAFTER REFERRED TO AS "DGM", AND GOUVIS ENGINEERING (A CALIFORNIA CORPORATION), HERINAFTER REFERRED AS "GE".

WHEREAS DGM HAS INVENTED A LIGHT GAUGE STEEL SECTIONED FLOOR TRUSS SYSTEM HERINAFTER REFERRED TO AS "THE SYSTEM", AND WHEREAS DGM DESIRE TO RETAIN GE FOR THE NECESSARY STRUCTURAL ENGINEERING DESIGN RELATED TO THE INVENTION, AND WHEREAS GE WHICH HAS THE PROFESSIONAL CAPABILITY TO RENDER SAID REQUIRED ENGINEERING DESIGN SERVICES, DGM AND GE HEREBY AGREE TO THE FOLLOWING TERMS AND CONDITIONS FOR SAID PROFESSIONAL SERVICES.

RECITALS

DGM WILL RETAIN ALL PROPRIETARY DESIGN AND PATENT RIGHTS TO THE SYSTEM, AND WILL ASSUME ANY AND ALL LIABILITIES FOR ANY PATENT INFRINGEMENTS, OR ANY CLAIMS MADE BY OTHERS WHO MAY SEEK REMEDY FOR OWNERSHIP RIGHTS OF THE SYSTEM OR ANY PART THEREOF, AND WILL HOLD GE, AND ALL EMPLOYEES OF GE HARMLESS IF ANY CLAIMS ARE MADE AGAINST EITHER DGM AND/OR GE AND AND/OR ANY OF GE's EMPLOYEES INCLUDING BUT NOT LIMITED TO COSTS FOR DEFENSE AS TO LAW SUITS INVOLVING DESIGN AND/OR PATENT RIGHTS OR CLAIMS OF PROPRIETARY OWNERSHIP BROUGHT ABOUT BY OTHERS.

GE WILL MAINTAIN ERRORS AND OMISSIONS INSURANCE COVERAGE FOR ERRORS OR OMISSIONS MADE IN THE DESIGNS BY GE BY EITHER SELF INSURING OR BY MAINTAINING A POLICY OF INSURANCE WITH A COMPANY THAT NORMALLY SELLS COVERAGE FOR SAID DESIGN ERRORS OR OMISSIONS. SAID COVERAGE WILL IN NO CASE BE LESS THAN $250,000.00 AS AN AGGREGATE AMOUNT IN ANY ONE YEAR PERIOD.

GE AND A LIMITED NUMBER OF GE EMPLOYEES IN THE PURSUIT OF THIS AGREEMENT , HAVE KNOWLEDGE OF CERTAIN PATENTABLE IDEAS BROUGHT FORTH BY DGM, AND ALL WILL, ON A BEST EFFORTS BASIS PROTECT THIS SECRET INFORMATION FROM ANY UNRELATED ENTITIES FOR THE BENEFIT OF DGM.

DGM AND GE AGREE THAT THE DEVELOPMENT AND THE FUTURE PROMOTION OF THE SYSTEM WILL REQUIRE AN ON GOING RELATIONSHIP BETWEEN THE PARTIES ABOVE

FIRST MENTIONED AND THAT GE WILL BE COMPENSATED FOR THE NECESSARY PROFESSIONAL DESIGN SERVICES IN THE FOLLOWING MANNER.

GE WILL BE COMPENSATED ON A TIME AND MATERIAL BASIS AT A RATE OF TWICE THE NORMAL THREE TIMES CLOCK. (CLOCK IS HEREIN DEFINED AS THE HOURLY RATE PAID TO AN INDIVIDUAL EMPLOYEE OF GE.) SEE ATTACHED EXHIBIT A WHICH IS THE CURRENT GE HOURLY RATE SCHEDULE FOR THE VARIOUS GE EMPLOYEES. (THE RATES NOTED ARE TYPICALLY MODIFIED UPWARD EACH YEAR TO ACCOMMODATE FOR INFLATION, AND TO AGREE TO THIS DGM HAS INITIALED THIS LINE IN THE RIGHT HAND MARGIN) *INITIAL*
GE WILL BE PAID HALF OF THE THEN CURRENT STATEMENT WHEN DEVELOPMENT FUNDING BECOMES AVAILABLE, AND THE OTHER HALF WILL BE PAID WHEN THE BUSINESS HAS A CASH FLOW SOURCE FROM SALES OF THE DEVELOPED PRODUCTION TO INDUSTRY. ALSO AT THAT TIME , AND AFTER ALL PRIOR BILLING IS PAID IN FULL, GE WILL COMMENCE CHARGING FOR SERVICES AT THE NORMAL THREE TIMES CLOCK.

GE WILL KEEP ACCURATE RECORDS OF TIME AND OUT OF POCKET REIMBURSABLE CHARGES FOR ALL WORK DONE IN THE PURSUIT OF THIS AGREEMENT AND WILL RENDER MONTHLY STATEMENTS TO DGM, OR TO ENTITIES HE MAY CREATE, OR AFFILIATE WITH, IN PROMOTING, SELLING OUTRIGHT, OR OTHERWISE USE OF GE EFFORTS IN THIS MATTER.

GE WILL ON A BEST EFFORTS BASIS ASSIST IN SALES OF THE FINAL MARKETABLE SYSTEM BY OFFERING IT'S USE TO THE SEVERAL DEVELOPERS AND BUILDERS WHO ARE CURRENTLY USING THE PROFESSIONAL SERVICES OF GE. IT IS HEREBY AGREED THAT GE WILL BE PAID A FINDERS FEE COMMISSION FOR ANY AND ALL SUCCESSFUL SALES GE MAY CREATE. SAID FEE WOULD BE EQUAL TO THE STANDARD AMOUNT AS WILL BE DETERMINED BY DGM WHEN ACTUAL SALES BEGIN.

IT IS THE BELIEF OF BOTH DGM AND GE THAT THE SYSTEM, AND IT'S ULTIMATE MARKETABILITY IN THE BUILDING INDUSTRY WILL REQUIRE THE ON GOING SERVICES OF GE, AND AS AN INDUCEMENT FOR GE TO REMAIN WITH THE PROGRAM, DGM DOES HEREBY GRANT TO GE A FIVE PERCENT OWNERSHIP / PARTICIPATION OF STOCK OR INTEREST IN THE ENTERPRISE AS ORGANIZED BY DGM. THIS INCLUDES BUT IS NOT LIMITED TO A FIVE PERCENT OF THE GROSS INTEREST IN THE SALE OF THE SYSTEM TO ANOTHER BUSINESS ENTITY.

DGM WILL PROVIDE INFORMATION TO GE FROM TIME TO TIME WHICH WILL REQUIRE THE PROFESSIONAL DESIGN SERVICES BY GE, AND GE WILL PROVIDE SAID SERVICES IN A TIMELY FASHION AS REQUIRED.

TERMINATION

EITHER PARTY MAY TERMINATE THIS AGREEMENT WITHOUT CAUSE UPON WRITTEN NOTIFICATION THIRTY DAYS PRIOR TO THE DATE OF TERMINATION. ALL WORK PRODUCT BY GE WILL IMMEDIATELY CEASE AND ALL BILLING WILL BECOME DUE AND PAYABLE TO GE WITHIN THIRTY DAYS OF SAID TERMINATION. UPON TERMINATION GE WILL WAIVE THE FIVE PERCENT INTEREST IN THE DGM ENTERPRISE IF TERMINATION OCCURS PRIOR TO THE FINAL DEVELOPMENT OF THE SYSTEM AS DETERMINED BY GE.

ARBITRATION

THE STANDARD ARBITRATION RULE WILL PREVAIL IF THERE IS A DISAGREEMENT BETWEEN THE PARTIES WHO HAVE AFFIXED THEIR SIGNATURES BELOW.

ASSIGNMENT

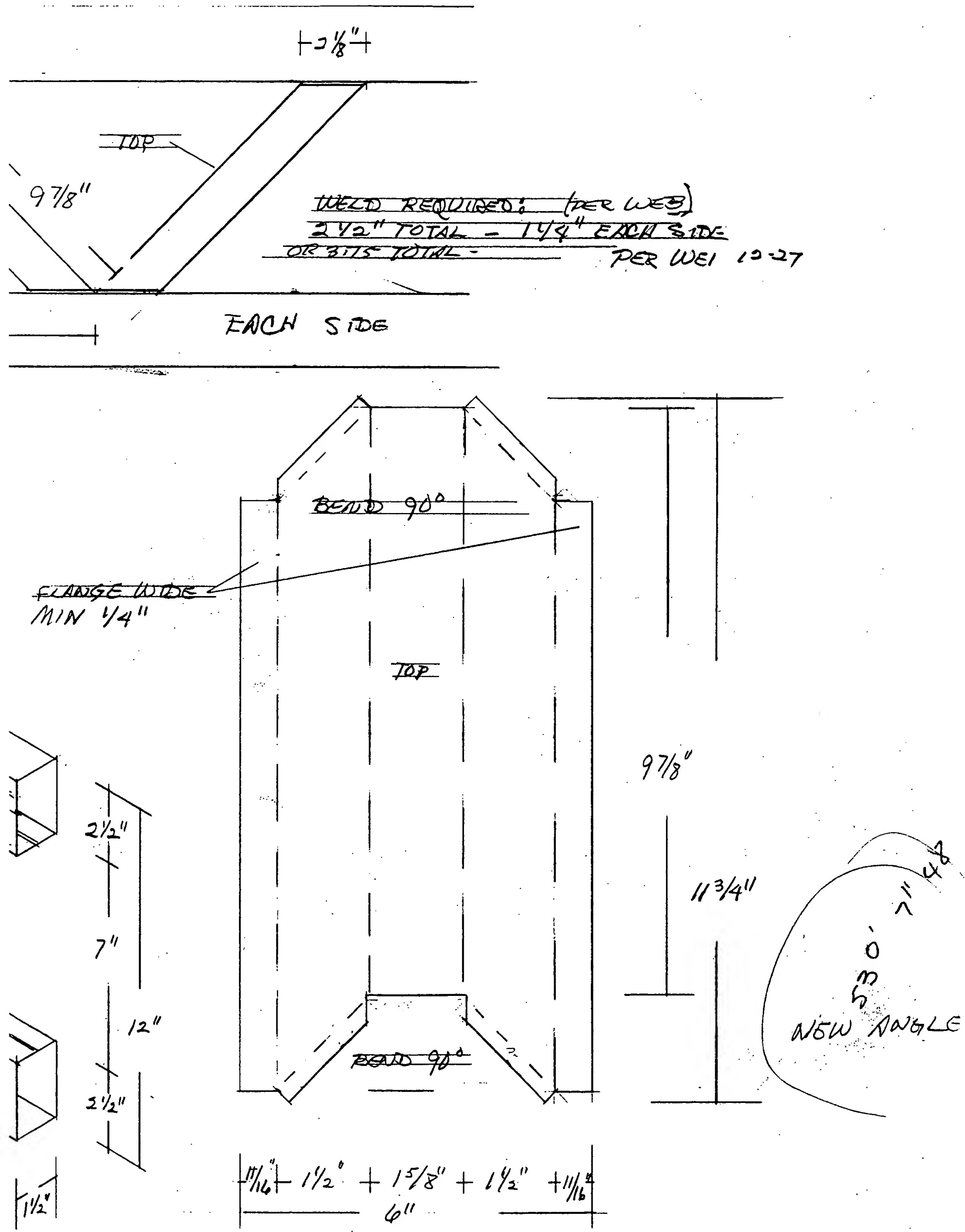
TERMS OF THIS AGREEMENT WILL PREVAIL UPON ALL HEIRS, ASSIGNEES, OR USERS OF ANY NATURE OF THE SYSTEM.

AGREED THIS 20 TH DAY OF DECEMBER, 1995

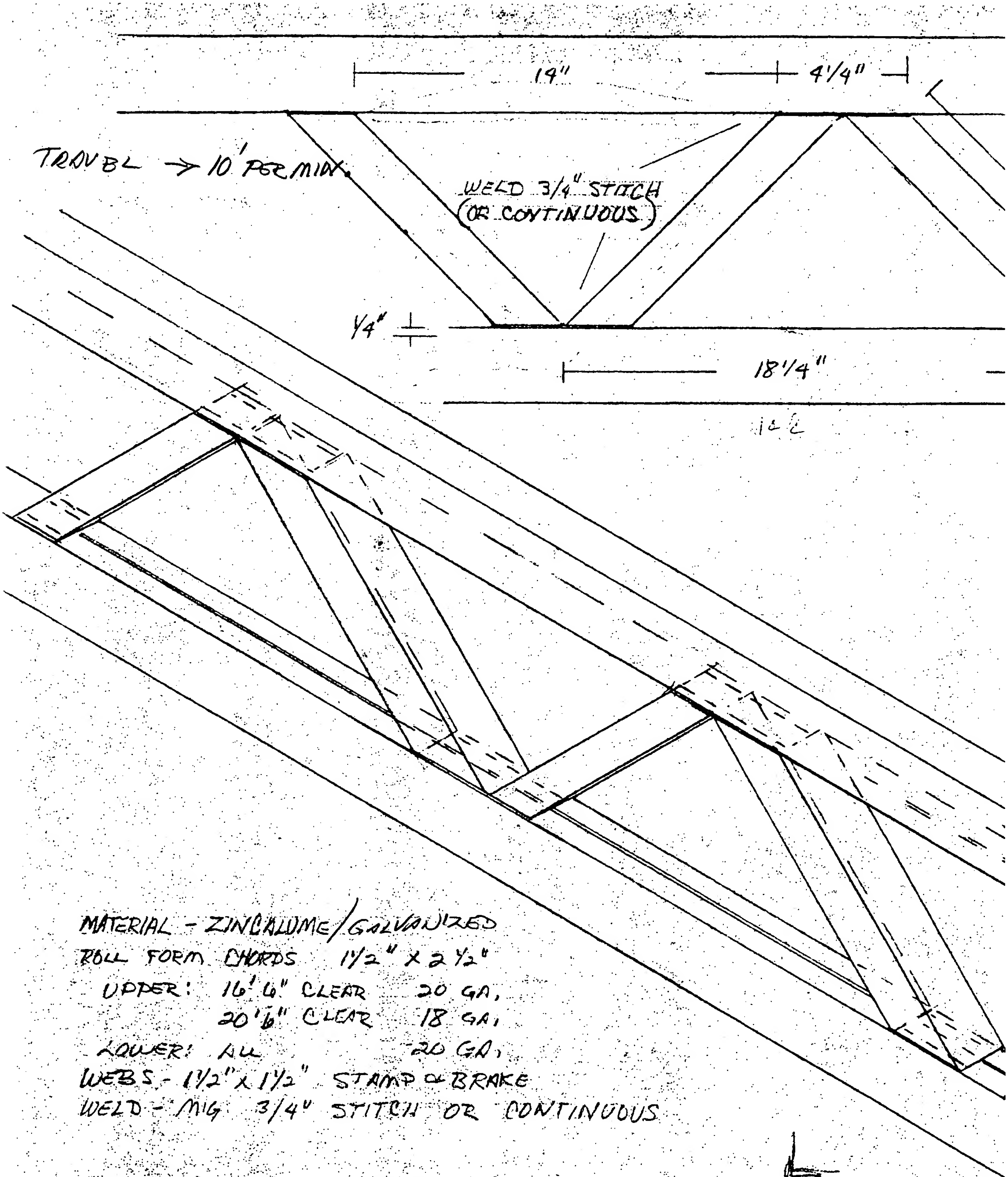
GOUVIS ENGINEERING

DARRELL G. MEYER
13269 SOFT CLOUD WAY
VICTORVILLE, CA. 92392
(619) 955-9736

SAEED BEKAM, PRESIDENT


2 1/8"
TOP
9 7/8"
WELD REQUIRED: (PER WEB)
2 1/2" TOTAL - 1 1/4" EACH SIDE
PER WEI 12-27
EACH SIDE
BEND 90°
FLANGE WIDE
MIN 1/4"
TOP
9 7/8"
11 3/4"
2 1/2"
7"
12"
2 1/2"
1 1/2"
11/16" 1 1/2" 1 5/8" 1 1/2" 11/16"
6"
NEW ANGLE
BEND 90°

A-2



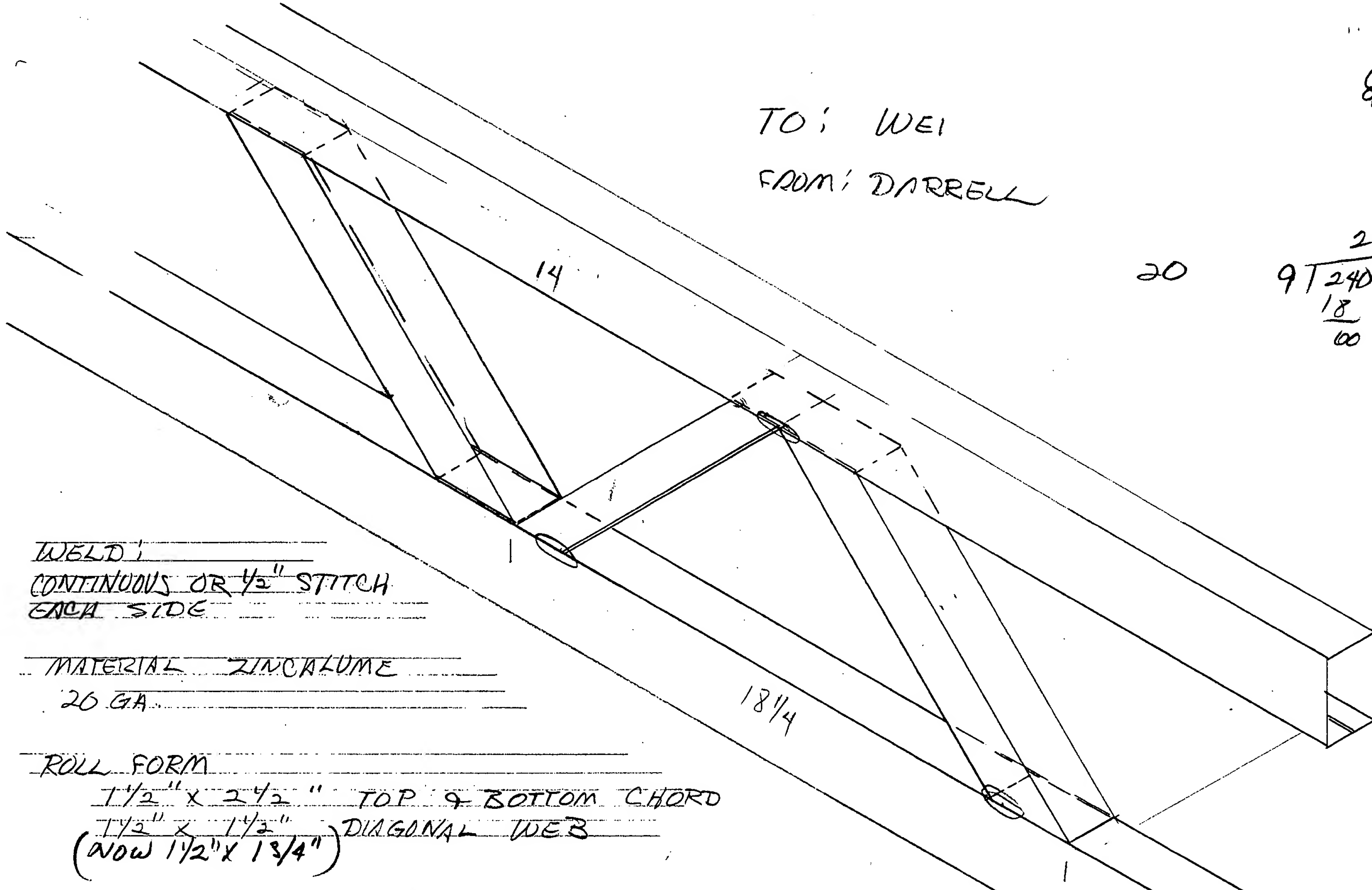
MATERIAL - ZINCALUME/GALVANIZED
ROLL FORM CHORDS 1 1/2" X 2 1/2"
UPPER: 16' 6" CLEAR 20 GA.
20' 6" CLEAR 18 GA.
LOWER: ALL 20 GA.
WEBS - 1 1/2" X 1 1/2" STAMP & BRAKE
WELD - MIG 3/4" STITCH OR CONTINUOUS

DARRELL G. MEYER 12-15-95

60 - 3000
90 - 4000

TO: WEI
FROM: DARRELL

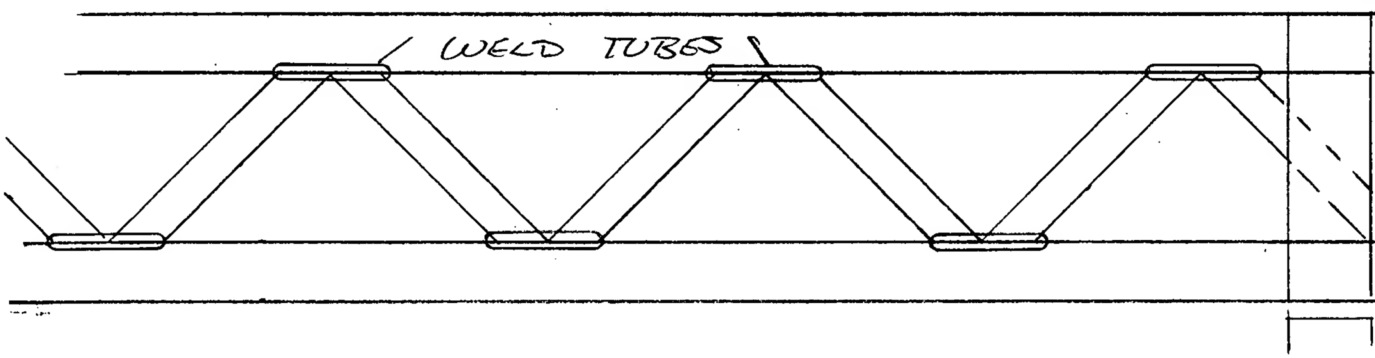
20 $\quad 9\overline{)240}$ = 27, remainder: 18 / 60



WELD:
CONTINUOUS OR 1/2" STITCH
EACH SIDE

MATERIAL ZINCALUME
20 GA.

ROLL FORM
1 1/2" x 2 1/2" TOP & BOTTOM CHORD
1 1/2" x 1 1/2" DIAGONAL WEB
(NOW 1 1/2" x 1 3/4")



FOR VERTICAL TRANSFER
FIELD INSTALL 3 1/2" x 1 1/2" TRACK

@ $3 PER FT

TRUSSTEEL JOIST / HEADER

DARRELL G. MEYER 1-10-96

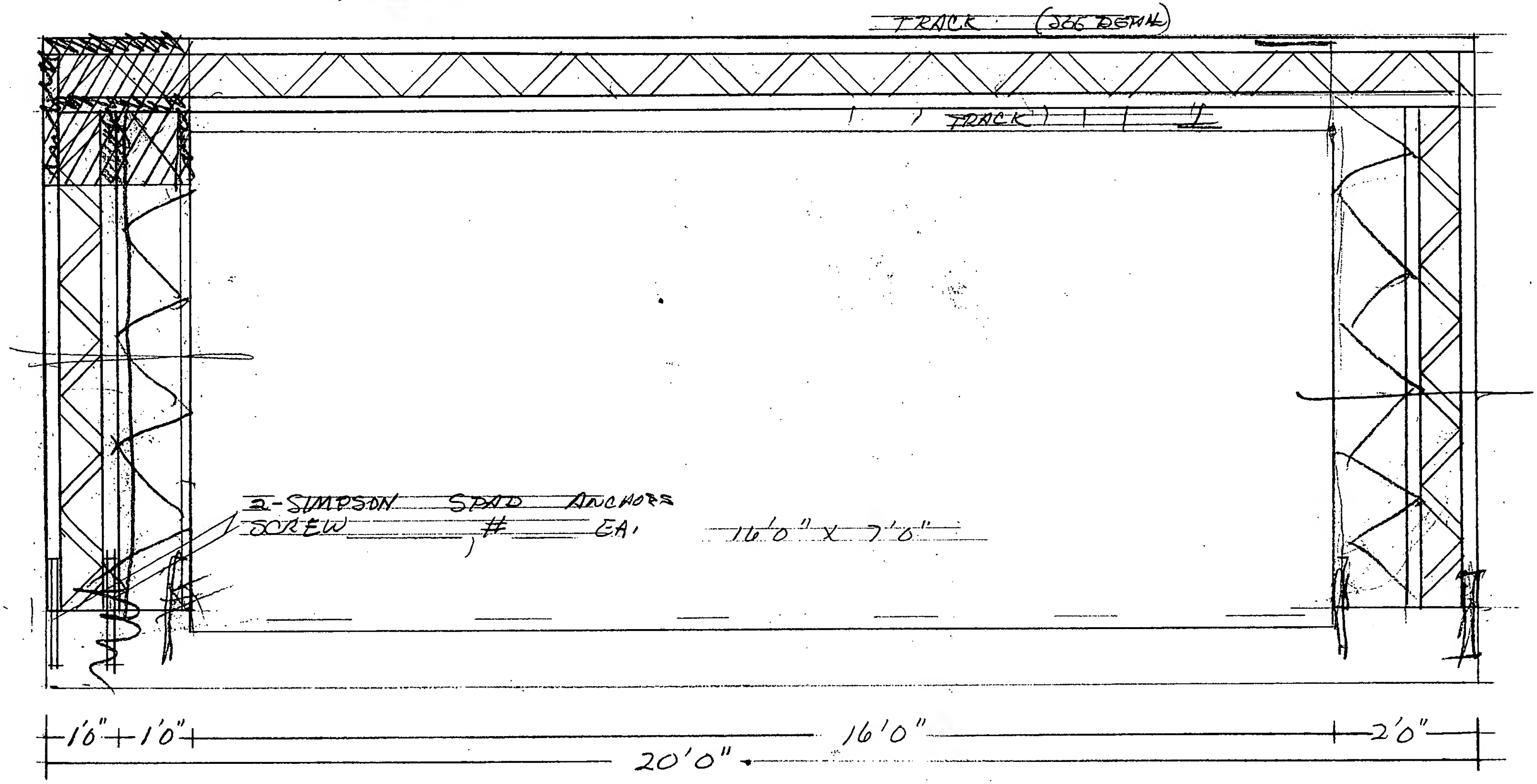
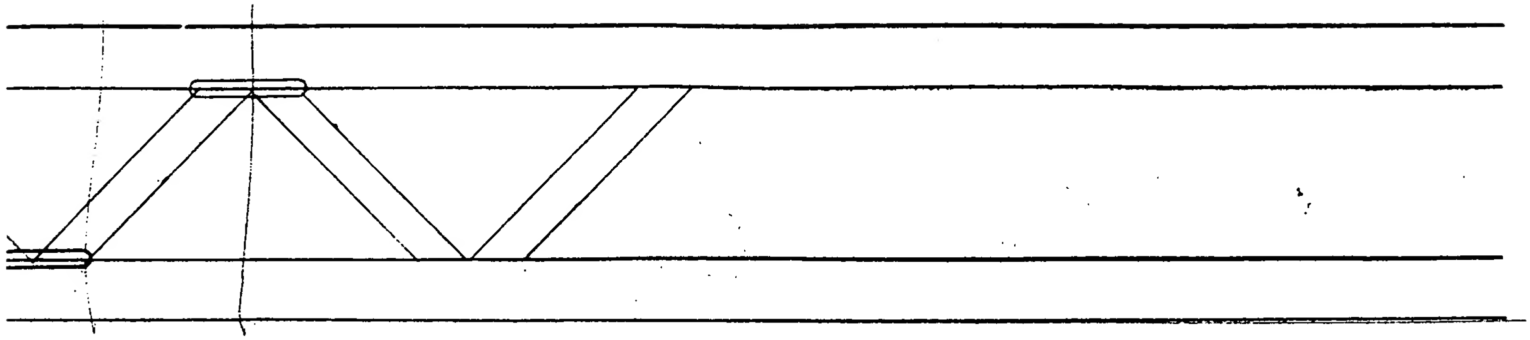


Exhibit 7

B-2



TO; W51
FROM DORRELL
12-27-95

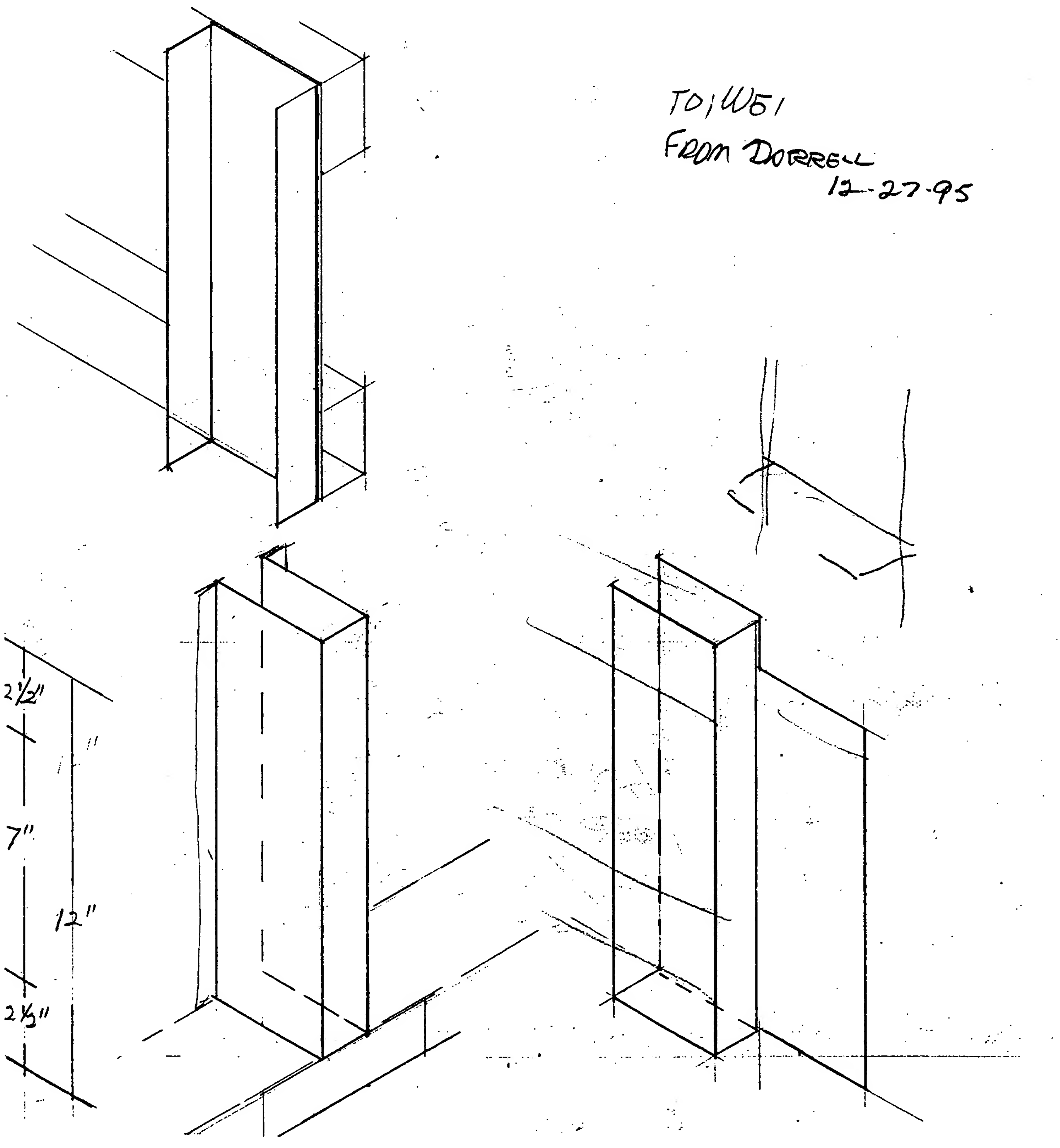


exhibit 8

WED 2-14-96 4-10
TUES 3-26-96
DON MOODY
WESTERN METAL 800 365-5284
6510 GENERAL DRIVE

UNCOILER - DOUBLE USED	15,000
PUNCH PRESS 75 TON USED	30 000
TOOLING - DUAL Δ	25,000
ROLL FORMER 15 STA. 3"	40,000
FEEDER - CONTROL - PUNCH	17500
TOOLING - ROLL FORMER	30 000
DAVE MOTOR CONTROL	10 000
FLYING FLANGE, FRAME & CONTROL	25 000
TOOLING - FLANGE	30,000
STACKING & CONVEYOR SYSTEM	10,000
CUT-OFF SHEAR - CHOP SAW	10,000
	$243,000

COPY MOODY 3-26-96

exhibit 9

Exhibit 10

WESTERN METAL
LATH & STEEL FRAMING SYSTEMS

February 16, 1996

Mr. Darrell G. Meyer
TRUSSTEEL
13269 Soft Cloud Way
Victorville, CA 92392

Re: Steel Floor Truss

Dear Darrell:

It was a pleasure meeting you earlier this week and we appreciate the opportunity to consider your steel floor truss idea.

We have run some very preliminary numbers and at this early stage they look encouraging. Some of the things that would help us refine the numbers are the following:

- Load Tables for the Trusses with 20 gage, 18 gage, and a combination of 20 gage and 18 gage chord members.
- Market Prices of competing products (open web only)
- The current size of the open web floor joist market.
- The anticipated roll forming and assembly rate (feet per minute)
- Some details on end treatments (where the web spacing does not work out exactly).

We'll also try to research some of the above, but anything you can come up with would probably accelerate the process. In addition, you should be thinking of how you might want to structure the potential royalty and license agreements. I have some ideas which we can discuss when appropriate, but if your desires are significantly different I would need to consider them in assessing the overall product feasibility.

I'll call you sometime during the week of the 26th to arrange our next meeting.

Very truly yours,

Donald R. Moody, P.E.
President/CEO

6510 General Drive • Riverside, CA 92509 • (909) 360-3500 • FAX (909) 360-3131

Exhibit 11

THU 2-22

ALPINE TRUSS ALANG/UNIMAST 800 755-6005
MAY
3/4"x 3""

NO INTEREST IN FLOOR TRUSS

CINDY

ESCONDIDO TRUSS 14

38' 3 8TAN
" 16' "
38' — 14" 130
16' $50

14

16"
15 RISER

I

2 3 -
295 3.25
$165 ☐'

GUS TRUSS - WESTERN METAL 800 365-5284
COST 3.00 BID 3.80
BOX TUBE

MITEK - DIETRICK - MIKE POLLACK 800-325-8075

ALPINE / UNIMAST 800 755-6005

TRI-CHORD 619 588-2591
RETAIL $2.25 (250-265)

INTEGRA

RAY GRAGE - ENGINEER 800 472-4302
350 RAILROAD CANYON SUITE A
AMAT

TOMEN BLDG. COMPONENTS 909 428-1600

TRUSWALL, ARLINGTON TX 800 521-9790
PERRIS CALIF TRUSS 909 657-7491
POMONA WD 909 623-2448
LARRY HATFIELD
TUSTIN BLDR FRAMING 714 573-4449

TRUSJOIST MAC MILLAN TJL
CORONA 800 969-6772
MARK DAVIS 714 937-5055
14" MIN. OPEN WEB, CUSTOM WEB
PRICE $ 3. TO 3.
LOAD 40/10 40/20

TJI. 35 DF
11 7/8 DEPTH
SPAN PRO 16" O/C ~~20'~~ 17'7" 1.20
35 16" O/C 20'9" 1.50
24 OC 14'9'
10/40 (PRO 24 O/C 18'2" 1.50 QUOTE LUMBER
LAMINATED
1 1/2 x 1 1/2") 3/8" WEB WEIGH 2.2 LBS/FT.
2 5/16 x 1 1/2" > D.F.

THU
2-22

DON MORSE

TRI-CHORD   EL CAJON   619 588-2591

* CURT KINNEY   GAIL VAN AKEN, LV 702 642-7548
IN L.V.

C

~~24~~" DEPTH   90 LB.   28'6"   TOP CORD

PRESS JOINT

12" DEPTH $1.65 PER FT.

24" O.C.   ~~26~~'   18' 6"

19.2.   28'   20'

BOT. CHORD BEARING

ALL CUSTOM MADE

JAMES TRUSS   CRAIG ROAD & I 15

12" 12' SPAN 1 GIRDER $1.60 LIN. FT.
F.O.B. YD.

QUOTE GAIL ~~3-~~ 3-4   10:00

11 16" 38 24

10 TRI CHORD TRUSTJOIST 1.50 $1.65 7-17-96

14 GANGE

16 PDD 1.26

25DC 1.52

55 3.04

2x10 12' 12.50

2x12 12' 15.58   549/M

THU 2-22

ALPINE / UNIMAST 800 755-6005

GRAND PRAIRE, TEXAS

JACK [DAVID WILLIS 4160]

NOTHING IN FLOOR TRUSS

MON 2-27 DAVID WILLS

ROOF TRUSS JOHN CARPENTER

22, 20, 18

DOUBLE SHEAR SCREW - 1 SIDE ONLY

MANUF. IN MORRO G

WAREHOUSE IN SACTO

THU
2-22

MITEK - DETROCK 800 325-8075

TOM

DOESN'T FEEL COMPETETIVE WITH WOOD
DOES MAKE POSISTRUT (WOOD WEB)

[illegible] [illegible] 776-[illegible]

JIM GAIL

MARKET POTENTIAL

Wood Truss Council 608/274-4849
5937 Meadowood Dr., #14
Madison, WI 53711

Kirk Grundahl, Exec. Director (Suzy Sandy)

580 members

(3-19-96)

1992 Production:

I Joists - 223 million feet

Parallel Chord (open) - both wood and steel - 221 million feet

Projection year 2000 joint study with NAHB, George Carter *

I Joists - 530 million feet

Parallel Chord - both wood and steel - 290 million feet

May change name to reflect wood and steel

Mitek - both

Open to steel engineered membership.

*Expect increase primarily due to lower lumber quality.

DRM
4-3-96

exhibit 12

714-361-9295

GE

GOUVIS ENGINEERING

NEWPORT BEACH • SAN DIEGO • PALM SPRINGS

GOUVIS ENGINEERING

FAX TRANSMITTAL

DATE: 2/29/96

TO: DARRELL MEYER

FAX NUMBER: 619-955-9736

ATTENTION:

FROM: WEI

PROJECT NAME:

GE JOB NUMBER: 12250

NUMBER OF PAGES: 2 (INCLUDING THIS TRANSMITTAL)

REMARKS: I SQUIZED OUT A LITTLE BIT OF TIME TO GET THIS FAR. I DON'T KNOW IF I CAN GET ANY TIME ON THIS TO FINISH THE TABLE. I HOPE THIS HALF CAN HELP YOU. LET ME KNOW WHEN YOUR MEETING IS.

IF YOU HAVE ANY QUESTIONS, OR IF YOU DID NOT RECEIVE ALL PAGES, OR PORTIONS OF THIS TRANSMITTAL ARE ILLEGIBLE, PLEASE DO NOT HESITATE TO CALL THIS OFFICE.

4400 CAMPUS DRIVE • NEWPORT BEACH, CALIFORNIA 92660 • (714) 752-1612 • FAX (714) 752-5321
2150 EAST TAHQUITZ CANYON, SUITE 9 • PALM SPRINGS, CALIFORNIA 92262 • (619)323-5090 • FAX (619)325-2863
1747 HANCOCK STREET, SUITE B • SAN DIEGO, CALIFORNIA 92101 • (619) 295-5174 • FAX (619) 295-1579

SPAN TABLE (CENTER TO CENTER)

LOAD	TRUSS I	TRUSS II	TRUSS III	TRUSS IV	TRUSS V
DL=10 LL=40 TL=50	T/C : 20GA, 33G B/C : 20GA, 33G	T/C : 18G, 33G B/C : 20G. 33G END = 18G	20G, 50G 20G, 33G END = 20 G	18G, 50G 18G, 33G END = 18G	18G, 50G 20G, 50G END : 18G
		16'-10" $\Delta_{TL} = .441" = \frac{L}{458}$ $\Delta_{LL} = \frac{L}{572}$	16'-5" $\Delta_{TL} = .449 = \frac{L}{439}$ $\Delta_{LL} = \frac{L}{549}$	19'-7" $\Delta_{TL} = .687" = \frac{L}{342}$ $\Delta_{LL} = \frac{L}{428}$	19'-9 1/2" $\Delta_{TL} = .825" = \frac{L}{288}$ $\Delta_{LL} = \frac{L}{360}$
DL=20 LL=40 TL=60					

exhibit 13

FRI 3-8

TRUSS WALL

CALIF, TRUSS - DON 909 657-7491

12-16

11¼" $2.71 40.44 10-12 OC

14¼ 2.97 12 714

16

24

FLOOR JOIST PRODUCT COMPARISON

MAX. SPAN / SPACING / COST ANALYSIS

COMPARISON

JOIST DEPTH	JOIST SERIES	COST LIN. FT.	SPACING 12" O.C. SPAN	COST S.F.	16" O.C. SPAN	COST S.F.	24" O.C. SPAN	COST S.F.
9 1/4"	2x10 D/F	.97	17'5"	.97	13'11"	.72	12'3"	.48
11 1/4"	2x12 D/F	1.24	20'2"	1.24	16'7"	.93	14'3"	.62

MAX STD. LNGTH	DLR STOCK LNGTH	CUT TO ORDER	CUSTOM ORDER	REQ. BLKG.	REQ. CAPS	MULTI-SPAN MAX	WEIGHT FT.

	DLR STK LENGTH	CUT TO ORDER	CUSTOM ORDER
	20'		
	20'		
TJI	40'	YES	
TRUSWAL			YES
TJL			YES

CUT ORDER | ORDER TO LENGTH | CUSOM ORDER

2x10 .83
2x14

* 16"OC - 1/3 MORE $

L /360

	JOIST DEPTH	JOIST SERIES	12" O.C.	16" O.C.	COST S.F.	24" OC.	COST S.F
#2+ 600/M	9 1/4"	2X10 SOLID WD.					
#2+ 620	11 1/4"	2X12 SOLID WD.		15'8"		12'9"	
1.33 LIN.	11 7/8"	TJI/25 PRO		18'1"		14'9"	
1.56 LIN	11 7/8"	TJI/25 DF		21'4"		18'9"	
2.88 LIN	11 7/8"	TJI/55 DF		29'9"		22'10"	

GAMMAL

JOIST DEPTH | JOIST SERIES

12" TRUSS WALL (STL. WEB)

14" TRUSSWALL (STL WEB)

16" 24"

12" OPEN WEB (WD)

14" OPEN WEB (WD) 20'

16"

MULTI-BEARING
32' 36'

FRI 3-7-95

CINDY

ESCONDIDO TRUSS 800 367-8787

2x4 W 2x4

14"

\# 2.36
2 | 4730

20,000 LN. FT.

100 TRUSS

100 TRUSS 20' 2010

20

2.35

100 - 20' 2000 $4,730

MILGARD 909 676-2688
TEMECULA

SALES

3/4"

FRI- 3-7-96

GANG NAIL FONTANA

16
20

JOE 14" $2.70 $2.80

UP TO 22 SPAN UP ~~18~~' 40 O/A

CUSTOM MADE

16 24

	JOIST DEPTH	JOIST SERIES	
	14"	TJL	
LIN.			
1.38	11 7/8	LP126	
1.98	11 7/8	LP136	2 1/4 CORD
1.56	11 7/8	LP132	

GANAHL

			SPAN			
JOIST DEPTH	JOIST SERIES	PER A	16" O.C	COST SFT	24" OC	COST S.F.
	18	872				
10"	1000EJ-2" 16GA	1127	20'11"		18'3"	
	14	1403				
10"	1000EJ 2" 14GA		22'0"		19'8"	
12"	1200EJ 2" 16GA	1273	24'4"		20'8"	
	14	1586				
12"	1200 EJ 2" 14GA		26'2"		22'10"	

EJ 2"

~~MJ 2½"~~

Per
Don Mudy
8-7-96

.50
.33

~~K~~SI +2-3%

2-3%

JOIST TYPE/SERIES	JOIST DEPTH	COST LIN FT	12" O.C. SPAN	12" O.C. COST SF	16" O.C. SPAN	16" O.C. COST S.F.	24" O.C. SPAN	24" O.C. COST S.F.
2x10 DF #2+	9¼"	$ .97 ①						
2x12 DF #2+	11¼"	$1.24 ①						
TRUSWAL STL. WEB	11.25	$2.70						
TRUSWAL 4X2 STL WEB	14.25	$2.80						
DOUG FIR 2x10 #2+								
STEEL C 1000 EJ	10"							
1200 EJ	12"							

SOURCE ① GANAHL LUMBER

[illegible]

exhibit 14

GOUVIS ENGINEERING
NEWPORT BEACH • SAN DIEGO • PALM SPRINGS

GOUVIS ENGINEERING

FAX TRANSMITTAL

DATE: 3/13/96

TO: DARRELL MEYER

FAX NUMBER: 285-1369

ATTENTION: DARRELL

FROM: WEI

PROJECT NAME:

GE JOB NUMBER: 12250

NUMBER OF PAGES: 2 (INCLUDING THIS TRANSMITTAL)

REMARKS: FURTHER FINE-TUNING ~~TO~~ TO MAXIMIZE COST IS POSSIBLE.
CALL ME IF YOU HAVE Q'S.

IF YOU HAVE ANY QUESTIONS, OR IF YOU DID NOT RECEIVE ALL PAGES, OR PORTIONS OF THIS TRANSMITTAL ARE ILLEGIBLE, PLEASE DO NOT HESITATE TO CALL THIS OFFICE.

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1747 HANCOCK STREET, SUITE 8 • SAN DIEGO, CALIFORNIA 92101 • (619) 295-5174 • FAX (619) 295-1579

TRUSS III

TC= 20GA/50 BOT. C = 22G/50 , WEB= 25GA

END=20GA

	24" o/c	16" o/c	12" o/c
10PSF=DL 40PSF=LL	16'-3"	19'-10"	23'-0"

TRUSS V

TC= 18G/50 , BC= 20G/50 , WEB=25G/33

END = 18G

DL=10PSF LC=40PSF	19'-7"	22'-8"	25'-0"

Exhibit 15

TRUSSTEEL JOIST
COMPETITIVE PRODUCT COMPARISON
Maximum Span / Spacing / Cost

Joist Type	Joist Depth	Cost Per lin. ft.	12" O/C Span	12" O/C Cost Per sq. ft.	16" O/C Span	16" O/C Cost Per sq. ft.	24" O/C Span	24" O/C Cost Per sq. ft.	Std Lgth.	Dlr Stk	CTS	Order Lgth.	Cstm Mfg.
1000 EJ 18ga.	10"	$ 0.88		$ 0.88		$ 0.66		$ 0.44	20'			yes	
1000 EJ 16ga.	10"	$ 1.13	23'0"	$ 1.13	20'11"	$ 0.84	18'3"	$ 0.57	20'			yes	
1000 EJ 14ga.	10"	$ 1.41	24'10"	$ 1.41	22'6"	$ 1.06	19'8"	$ 0.71	20'			yes	
1200 EJ 16ga.	12"	$ 1.28	26'9'	$ 1.28	24'4"	$ 0.96	20'8"	$ 0.74	20'			yes	
1200 EJ 14ga.	12"	$ 1.59	28'10"	$ 1.59	26'2"	$ 1.19	22'10"	$ 0.80	20'			yes	
TRI-CHORD	12"	$ 2.20		$ 2.20		$ 1.65		$ 1.10					yes
TRI-CHORD	14"	$ 2.60		$ 2.60		$ 1.95		$ 1.25					yes
Trussteel 20[illegible]ga.	**12"**	**$** 1.60 **~~2.20~~**	23'4" **~~23'0"~~**	**$ 2.20**	21'4" **~~19'10"~~**	**$ 1.50**	17'3" **~~16'7"~~**	**$ 1.10**		**40'**	**yes**	**yes**	**yes**
Trussteel 18[illegible]ga.	**12"**	**$** 1,95 **~~2.50~~**	25'8" **~~25'0"~~**	**$ 2.50**	23'4" **~~22'6"~~**	**$ 1.88**	20'3" **~~19'9"~~**	**$ 1.25**		**40'**	**yes**	**yes**	**yes**

COPY D MOODY ... 01

BUSINESS FORMATION PLAN AGENDA

- Form new stock corporation (Corp)
  Issue stock 50% Angeles Metal Systems (AMS)
  Issue stock 50% Darrell G. Meyer (DGM)

- Elect officers & board

- Determine legal & accounting firm/method

- AMS Loan (capitalize) Corp. commitment $100,000

- Purchase order & check procedure

- Inventor (DGM) proceed with patent application (use patent)

- DGM assign patent rights to Corp, same distribution license fees

BUDGET (DETAIL SHEET 1)
MACHINES, TOOLS & FIXTURES

1.	Automatic Resistance Welder				$45,000
	See Janda Proposal				
2.	Truss Assembly Jig				$6,000
	Anaheim Welding - verbal				
3.	Rollers, Stands				$2,000
	Hytrol - verbal	Rollers	$1,254		
		Stands	472		
		Tax, freight	240		
			$1,966		
4.	Chain Transfer, Accumulator				$4,000
	3 - 12' chain assemblies, frames				
	electric drive, pneumatic lift				
	custom - Bid - Anaheim Welding				
5.	Miller Spot Welder & O.H. Track				$3,000
	Air $2,000, elect, track - etc.				
6.	Racks, Dollies, Chord Handling Lifts				$5,000
	custom				
7.	Banding, Shipping				$2,000

SCHEDULE TO 3 MONTH START-UP

Engineering $5,000

Provide load / span tables, start ICBO

Advertising & marketing

Draft copy and layout to start campaign with engineers, place ads in trade magazines, Metal Home Digest, Autómated Builder

Salaries

Darrel G. Meyer to supervise all custom manufacturing, purchase equipment, layout plant, participate in marketing and sales. Joe Mackewich in strong sales program, brochures, ads, personal calls

Rent

Locate approx. 12,000 s.f. within Angeles facility. Rent @ 20 cents per s.f. - $2,400

Utilities

TRUSSTEEL JOIST
PRODUCT COMPARISON
WOOD FLOOR JOISTS
MAXIMUM SPAN-SPACING-COST

L/360 Live Load Deflection--40#LL+10#DL

			12" O/C		16" O/C		24" O/C					
Joist type/series	Joist Depth	Cost Lin Ft.	Span	Cost Sq. Ft.	Span	Cost Sq. Ft.	Span	Cost Sq. Ft.	Std Lngth.	Dir. Stck	CTS	Cstm Mfg.
Doug Fir 2x10#2	9 1/4"	$ 0.97	17'5"	$ 0.97	13'11"	$ 0.72	12'3"	$ 0.48	20'			
Doug Fir 2x12#2	11 1/4"	$ 1.24	20'2"	$ 1.24	16"7"	$ 0.93	14'3"	$ 0.62	20'			
Trus Joist:												
TJI 25 Pro	11 7/8"	$ 1.33		$ 1.33	18'1"	$ 1.00	14'9"	$ 0.67		40'	yes	
TJI 25 DF	11 7/8"	$ 1.56	23'4"	$ 1.56	21'4"	$ 1.17	18'4"	$ 0.78		40'	yes	
TJI 55 DF	11 7/8"	$ 2.88	28'8"	$ 2.88	26'1"	$ 2.16	22'10"	$ 1.44		40'	yes	
Wood Web 4x2 4x2	14"	$ 2.36		$ 2.36		$ 1.77		$ 1.18				yes
Wood Web 4x2 4x2	16"	$ 2.50		$ 2.50		$ 1.88		$ 1.25				yes
Truswal 4x2 stl wb	11 1/4"	$ 2.71	23'4"	$ 2.71	19'3"	$ 2.03	12'10"	$ 1.36				yes
Truswal 4x2 stl wb	14 1/4"	$ 2.97	27'5"	$ 2.97	20"7"	$ 2.22	13'8"	$ 1.49				yes
TrustJoist TJL 4x2	14"	$ 3.40		$ 3.40		$ 2.55		$ 1.70				yes
TrustJoist TJL Lam	14"	$ 4.00		$ 4.00		$ 3.00		$ 2.00				yes
Louisiana Pacific:												
LPI 26	11 7/8"	$ 1.38	22'8"	$ 1.38	20'9"	$ 1.04	17'2"	$ 0.69		40'	yes	
LPI 36 2 1/4"	11 7/8"	$ 1.94	23'9"	$ 1.94	23'0"	$ 1.49	20'0"	$ 0.99		40'	yes	
LPI 32	11 7/8"	$ 1.56	24'6"	$ 1.56	22'0"	$ 1.17	18'10"	$ 0.78		40'	yes	
GangNail 4x2 4x2	14"	$ 2.70		$ 2.70		$ 2.02		$ 1.35				yes
GangNail 4x2 4x2	16"	$ 2.80		$ 2.80		$ 2.10		$ 1.40				yes

Source:
GANAHL
ESCONDIDO TRUSS
CALIFORNIA TRUSS
TJI McMILLAN
GANGNAIL

CO PY D Moody ... 01

TRUSSTEEL JOIST
PRODUCT COMPARISON
WOOD FLOOR JOISTS
MAXIMUM SPAN-SPACING-COST

L/360 Live Load Deflection--40#LL+10#DL

UPDATE 7-10

		Joist type/series	Joist Depth	Cost Lin Ft.	12" O/C Span	12" O/C Cost Sq. Ft.	16" O/C Span	16" O/C Cost Sq. Ft.	24" O/C Span	24" O/C Cost Sq. Ft.	Std Lngth.	Dir. Stck	CTS	Cstm Mfg.
GAN	1.04	Doug Fir 2x10#2	9 1/4"	$ 0.97	17'5"	$ 0.97	13'11"	$ 0.72	12'3"	$ 0.48	20'			
	1.30	Doug Fir 2x12#2	11 1/4"	$ 1.24	20'2"	$ 1.24	16"7"	$ 0.93	14'3"	$ 0.62	20'			
		Trus Joist:												
GAN	1.26	TJI 25 Pro 1.61	11 7/8"	$ 1.33		$ 1.33	18'1"	$ 1.00	14'9"	$ 0.67		40'	yes	
	1.52	TJI 25 DF	11 7/8"	$ 1.56	23'4"	$ 1.56	21'4"	$ 1.17	18'4"	$ 0.78		40'	yes	
	3.04	TJI 55 DF	11 7/8"	$ 2.88	28'8"	$ 2.88	26'1"	$ 2.16	22'10"	$ 1.44		40'	yes	
ESC	3.42	Wood Web 4x2 4x2	14"	$ 2.36		$ 2.36		$ 1.77		$ 1.18				yes
	"	Wood Web 4x2 4x2	16"	$ 2.50		$ 2.50		$ 1.88		$ 1.25				yes
CALTRUSS	2.80	Truswal 4x2 stl wb	11 1/4"	$ 2.71	23'4"	$ 2.71	19'3"	$ 2.03	12'10"	$ 1.36				yes
	3.00	Truswal 4x2 stl wb	14 1/4"	$ 2.97	27'5"	$ 2.97	20"7"	$ 2.22	13'8"	$ 1.49				yes
		TrustJoist TJL 4x2	14"	$ 3.40		$ 3.40		$ 2.55		$ 1.70				yes
		TrustJoist TJL Lam	14"	$ 4.00		$ 4.00		$ 3.00		$ 2.00				yes
		Louisiana Pacific:												
		LPI 26 1.49	11 7/8"	$ 1.38	22'8"	$ 1.38	20'9"	$ 1.04	17'2"	$ 0.69		40'	yes	
		LPI 36 2 1/4"	11 7/8"	$ 1.94	23'9"	$ 1.94	23'0"	$ 1.49	20'0"	$ 0.99		40'	yes	
		LPI 32	11 7/8"	$ 1.56	24'6"	$ 1.56	22'0"	$ 1.17	18'10"	$ 0.78		40'	yes	
		GangNail 4x2 4x2	14"	$ 2.70		$ 2.70		$ 2.02		$ 1.35				yes
		GangNail 4x2 4x2	16"	$ 2.80		$ 2.80		$ 2.10		$ 1.40				yes

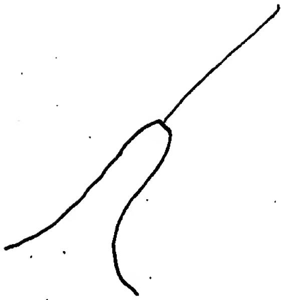
Source:
GANAHL BRYAN
ESCONDIDO TRUSS
CALIFORNIA TRUSS
TJI McMILLAN
GANGNAIL

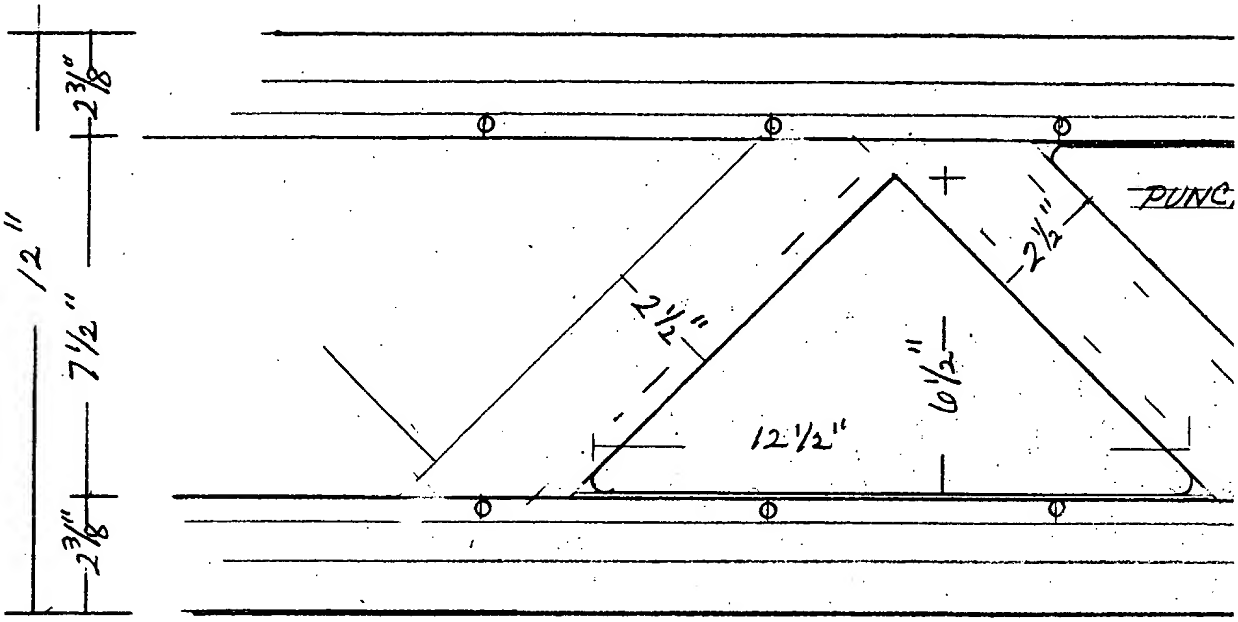
COPY D MOODY .. 01

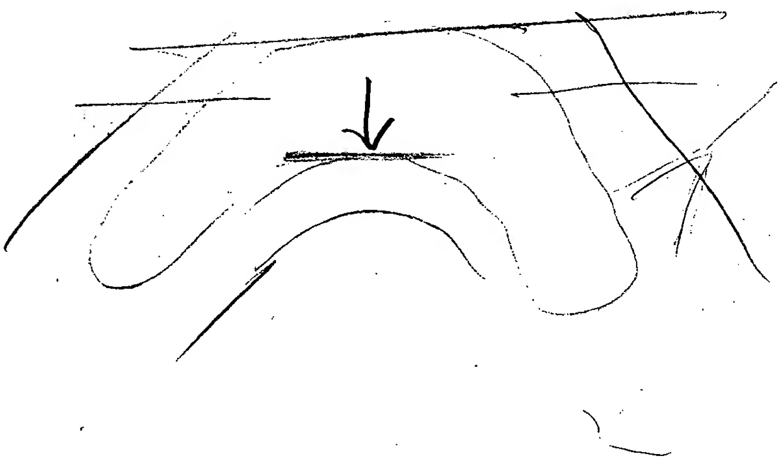
12 MOS. PRELIMINARY CASH FLOW PROJECTION
(INCLUDING 3 MOS. START-UP) POSTIVE <NEGATIVE>

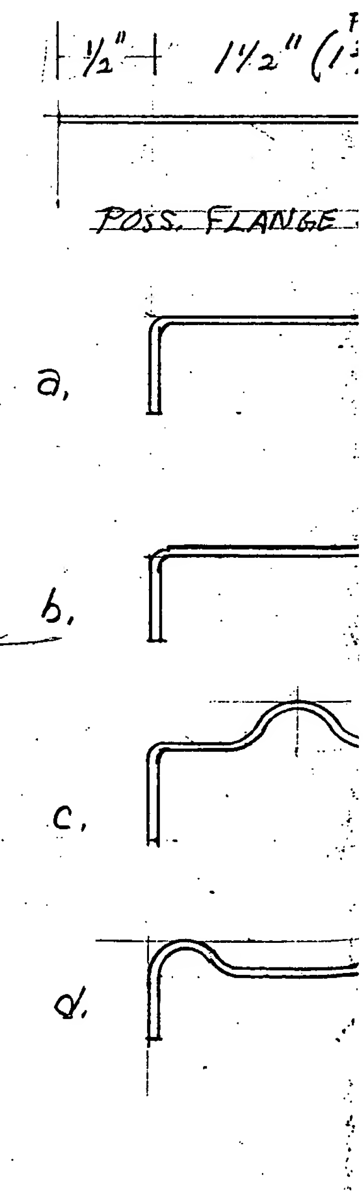
	% of Schedule	Total 3 mos.	4	5	6	7	8	9	10	11	12	Total
Sales Revenue (1)		-0-	(E) 50,000	(E)100,000	(E)100,000	150,000	150,000	150,000	150,000	150,000	150,000	1,125,000
Cost to Produce (2)						86,000						
Gross Profit / Margin						64,000						
Selling - Commission	(3%)		1,500	3,000	3,000	4,500						
Market - Advertising	(3%)		1,500	3,000	3,000	4,500						
Total Selling Cost			3,000	6,000	6,000	9,000						
Profit Before Expenses, G & A	(36%)		18,000	36,000	36,000	55,000	55,000	55,000	55,000	55,000	55,000	420,000
Expenses												
Engineering - Consultant			1,000	1,000	1,000	1,000						
Salaries - Officers						4,000						
Rent						2,400						
Utilities						1,500						
Telephone						500						
Vehicle, Travel, Entertainment						800						
Legal & Accounting						1,000						
General Office Expense, postage etc						500						
Insurance - Liability	(2%)					3,000						
Depreciation 120 mo - 60 mo.						2,000						
Total Expenses	(11%)		16,700	16,700	16,700	16,700	16,700	16,700	16,700	16,700	16,700	150,300
Total Startup, Machines, Fixtures, Jigs-3 mo		116,500										
Monthly over <short>			1,300	19,300	19,300	38,300	38,300	38,300	38,300	38,300	38,300	269,700
Cash Flow over <short>		<116,500>	<115,200>	<95,900>	<76,600>	<38,300>	-0-	38,300	76,600	114,900	153,200	
Net Cash after 12 mos.											+116,500	
Net Profit												269,700

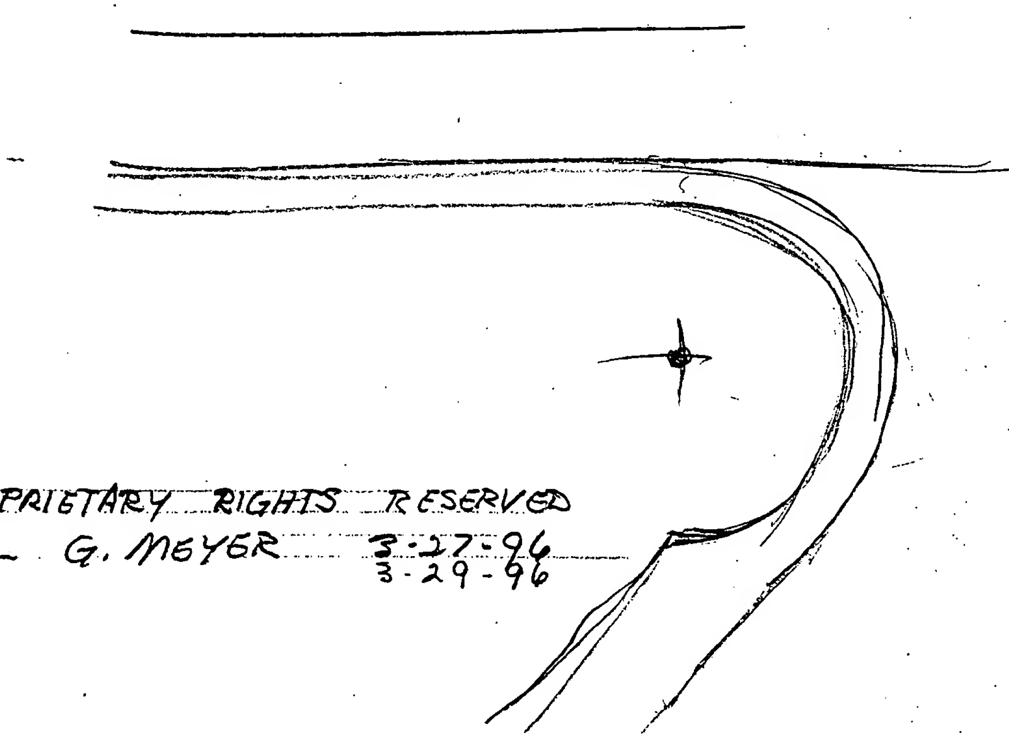
exhibit 6



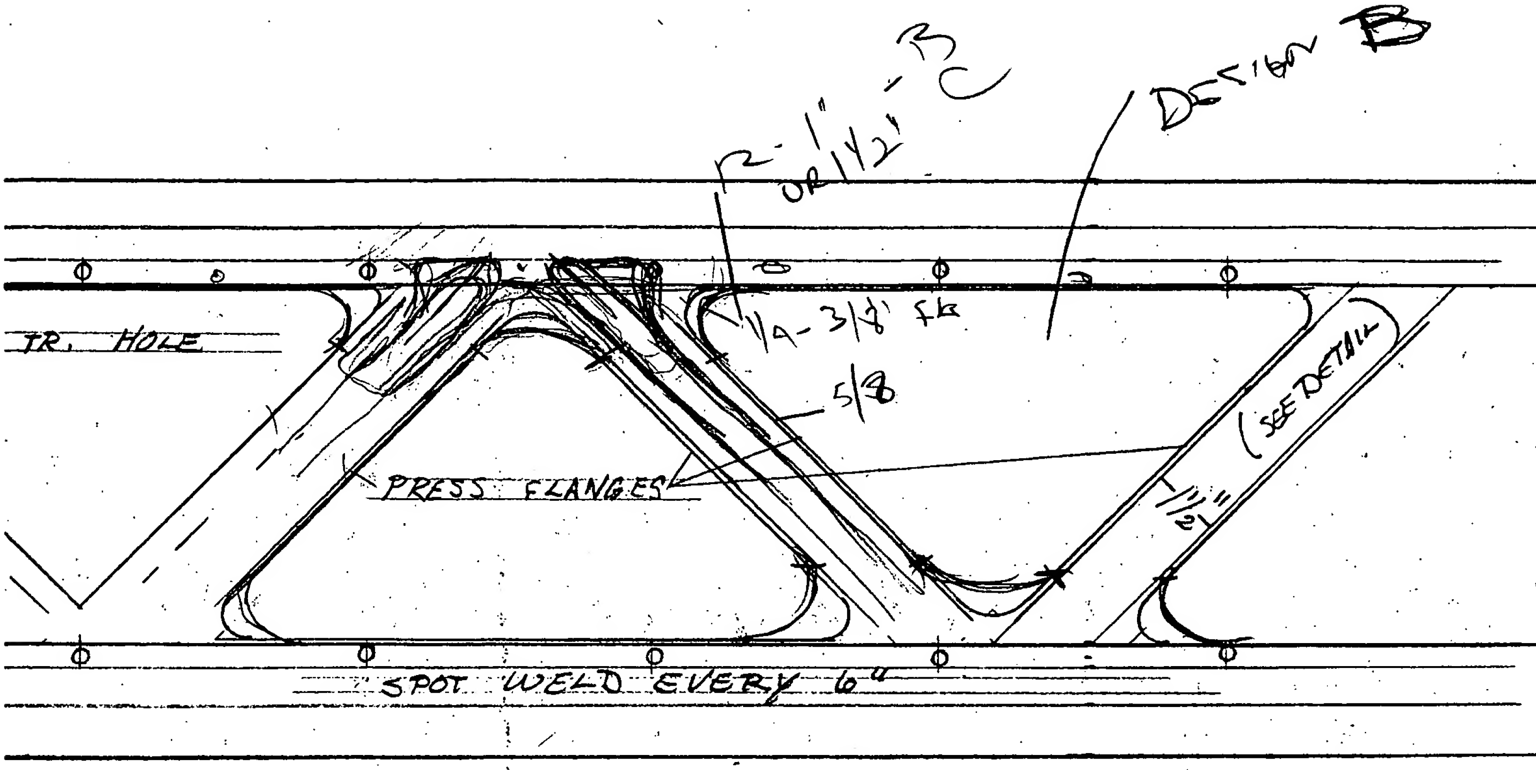








DARRELL G. MEYER 3-27-96
3-29-96


DESIGN B
R-1"
OR 1 1/2" -B
TR. HOLE
1/4-3/8" FL
5/8
PRESS FLANGES
(SEE DETAIL
1 1/2"
SPOT WELD EVERY 6"

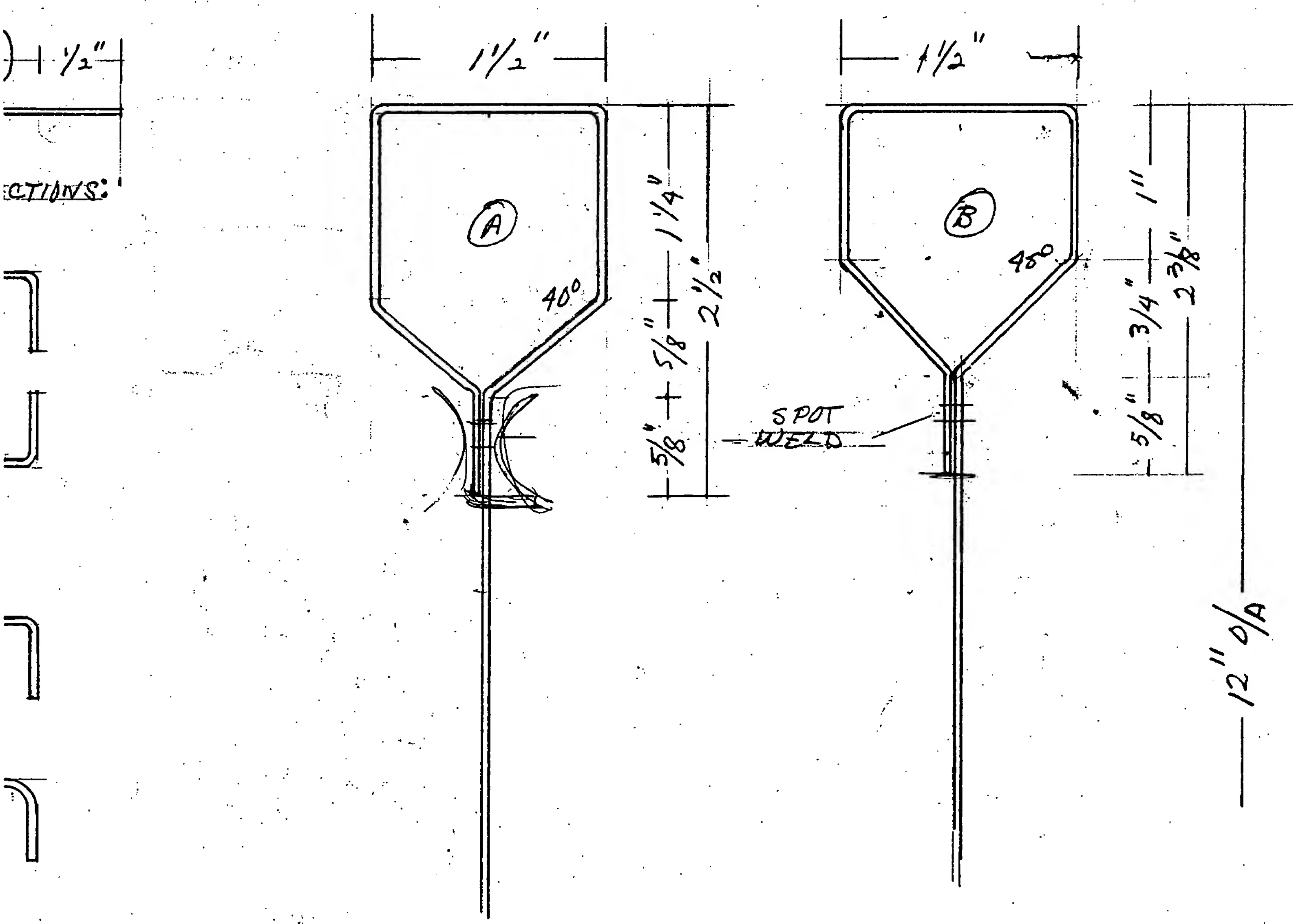
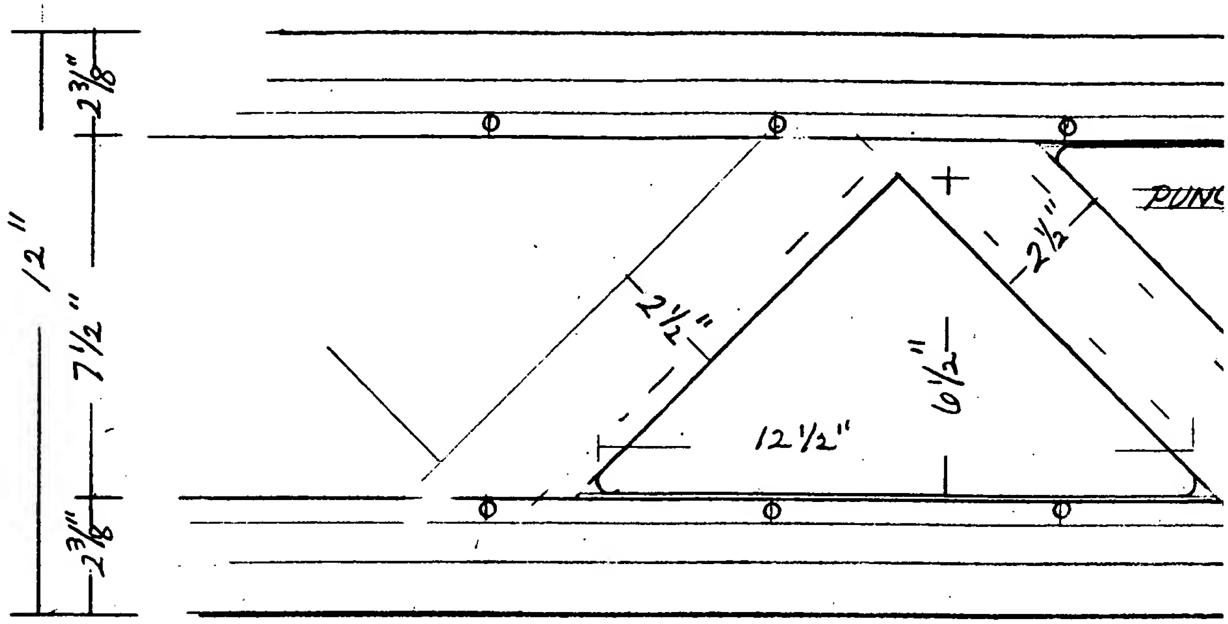

1/2"
CTIONS:
1 1/2"
A
40°
1 1/4"
5/8"
2 1/2"
5/8"
SPOT WELD
1 1/2"
B
45°
1"
3/4"
2 3/8"
5/8"
12" O/A

Exhibit 17

HOLE PUNCH



FRI 3-29-96

DEAR NICK —

THIS COMPOSITE DRAWING REFLECTS CHOICE OF TOP/BOTTOM CORD SECTION - EITHER A OR B AND POSSIBLE SECTIONS TO BE STAMPED IN WEBS.

WEB INDICATED PROPERTIES SEEM SIMILAR & O.K.

DON MOODY - WESTERN, SAID HE REALLY LIKED IT! "YOU HAVE A HOME RUN!"

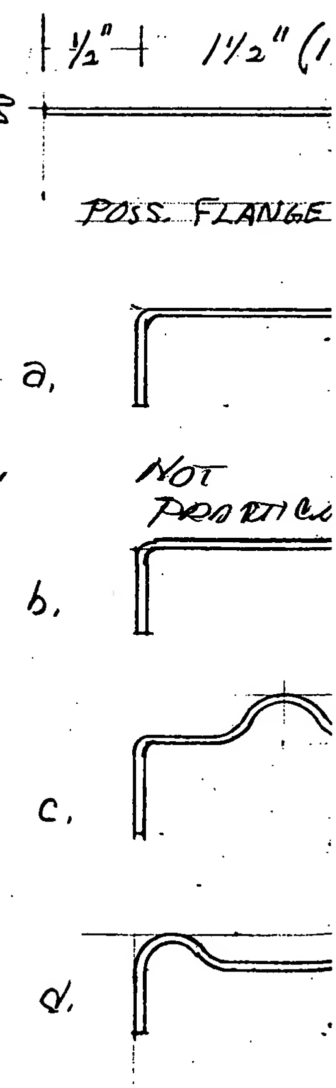


Exhibit 18

April 3, 1996

LETTER OF INTENT

This Agreement is entered into this day by and between the following Parties:

Darrell G. Meyer, (Hereinafter referred to as DGM)

Western Metal Lath (Hereinafter referred to as WM).

Recitals:

DGM has invented and is in the process of obtaining a patent (patents) on a fabricated steel "Trussteel Joist" and has developed know-how in connection with said invention.

WM desires to acquire an option to investigate said DGM invention and if favorable to proceed with license to manufacture said "Trussteel Joist", per License Agreement format as mutually agreed.

DGM will grant WM option for $75,000 payable: $25,000 upon execution of Option Agreement, $25,000 when satisfied and enters into License Agreement and $25,000 upon start-up of production.

DGM will share know-how with WM and coordinate engineering, testing of trusses, design of special machines, fixtures and components for manufacturing and such activities as per WM. DGM will be compensated at the rate of $5,000 per month, not to exceed 6 months, time of start-up or termination of option.

Outside services required or requested will be submitted to WM for prior approval and payment by WM.

Royalty rate of 4¢ per foot of sales with minimum annual royalty of $40,000

WM to have exclusive license for 12 western states.

GRANTOR	**GRANTEE**
Darrell G. Meyer	Western Metal Lath
By______________________________	By______________________________
Darrell G. Meyer	Donald R. Moody, President/C.E.O.
18 Vista Encanta	6510 General Drive
San Clemente, CA 92672	Riverside, CA 92509
(714) 361-9295	(909) 360-3500

exhibit 19

WESTERN METAL
LATH & STEEL FRAMING SYSTEMS

April 23, 1996

Mr. Darrell G. Meyer
TRUSSTEEL
13269 Soft Cloud Way
Victorville, CA 92392

Re: Steel Floor Truss

Dear Darrell:

This is verify that Western Metal Lath is interested in obtaining exclusive manufacturing, marketing, and distribution rights for the western United States for the light gage steel floor truss you are developing. During our discussions we have reached tentative agreement on the following terms and conditions:

- Western's exclusive manufacturing, marketing, and distribution area would include the states of California, Washington, Oregon, Montana, Idaho, Colorado, Utah, Nevada, Arizona, New Mexico, Wyoming, Texas, Alaska, and Hawaii.

- In exchange for the exclusive rights described above, Western would pay you a one time license fee of $75,000 plus the amount you invest in the development of this product (engineering, testing, documentation, patents, etc.) between now and the time the license agreement is formalized and agreed upon. Any expenditures made by Western toward the development of the product would apply against the final negotiated licensing fee.

- In addition to the license fee, Western would pay you a royalty of $.04 per lineal foot of truss produced and sold by Western with a guaranteed minimum of $40,000 per year in royalties, regardless of sales.

This letter, while expressing our interest and general agreement to the preliminary terms of the anticipated licensing arrangement, is not an agreement of any type between Western Metal Lath and Darrell Meyer. Prior to entering into any agreement beyond mutual cooperation toward the development of the product, the floor truss will have to be fully developed to the extent that a patent has been obtained, certified engineering data substantiated by testing exists, and an IBC-ER approval has been obtained. Additionally, the final agreement will require the approval of Western Metal Lath's Board of Directors.

6510 General Drive • Riverside, CA 92509 • (909) 360-3500 • FAX (909) 360-3131

That being said, we would like to emphasize our belief the floor truss you are developing, based on our preliminary analysis, is a viable product that will be well positioned to participate in the very significant open web floor joist market. We appreciate the opportunity you have presented to us and look forward to a long and mutually beneficial relationship with you.

Very truly yours,

Donald R. Moody

Donald R. Moody, P.E.
President/CEO

exhibit 20

LANE AND RODERICK, INC.
12640 Allard Street
Santa Fe Springs, CA 90670
TELEPHONE: 1-310-868-3465
FAX: 1-310-929-8791

QUOTATION LETTER

No. 02719

TO: TRUSSTEEL INC. BEVERLY
13269 SOFT CLOUD WAY
VICTOR VILLE, CA 92392

DATE: 05/14/96

ATTN: DARRELL MEYER
RFQ.#:

PHONE: (714) 361-9295
FAX: (714) 285-1369

DELIVERY	FOB	SHIP VIA
2 WEEKS	SANTA FE SPRINGS	YOUR TRUCK

QUANTITY	DESCRIPTION	UNIT PRICE	EXTENSION
ITEM# 1	QUOTE# 08631		
	TRUSS 240.00 LONG REV N/C		
	TRUSS 240.00 LONG		
3		384.17	1,152.51
4		335.10	1,340.40
ITEM#	QUOTE# 08631	8.25 + TAX	$1,450.98

SHEAR, LASERCUT FORM AND SPOT WELD

CUSTOMER SUPPLIED 20 GA ZINCALUM PER BP

Quoted By: Warren, Brian C.

UNLESS OTHERWISE STATED HEREIN;PRICES REMAIN IN EFFECT 30 DAYS;PRICES DO NOT INCLUDE LOCAL OR STATE TAXES IF APPLICABLE;TERMS NET 30 DAYS WITH APPROVED CREDIT;FOB FACTORY;UNPAID BALANCES 30 DAYS PAST DUE WILL BE SUBJECT TO AN INTEREST CHARGE OF 1.5% PER MONTH (ANNUAL RATE 18%) FUTURE ORDERS WILL BE AUTOMATICALLY SOLD ON A C.O.D. BASIS

exhibit 21

Lane & Roderick, Inc.
Metal Fabricators for Industry

12640 Allard Street Santa Fe Springs CA 90670-4708 · (310) 868-3465 · Fax (310) 929-8791

PACKING SLIP
No. 03516
Page 1

SHIP TO:

TRUSSTEEL INC.
13269 SOFT CLOUD WAY
VICTOR VILLE, CA 92392

Phone: (714) 361-9295

P.O. No.	Ship Via	Terms	Date Shipped	CustID
VERBAL	YOUR TRUCK	COD	06/03/96	T1035

Quantity	Description		
4	TRUSS 240.00 LONG TRUSS 240.00 LONG	Rev : N/C	(Our Number 05796)

1 EA. CUSTOMER BLUEPRINT

By: Randall [illegible] Hoyer Date: 6/5/96

UNPAID BALANCES 30 DAYS PAST DUE WILL BE SUBJECT TO AN INTEREST CHARGE OF 1 1/2% PER MONTH (ANNUAL RATE 18%) FUTURE ORDERS WILL AUTOMATICALLY BE SOLD ON COD BASIS

6-3-96 Darrell

Exhibit 22

WESTERN METAL LATH
6510 GENERAL DRIVE
RIVERSIDE, CA 92509
(909) 360-3500

DRAWN ON
PNC BANK, OHIO, NATIONAL ASSOCIATION
MILFORD, OHIO
IN COOPERATION WITH
WELLS FARGO BANK, N.A.
#4759-605850

56-204/422

№ 001133

DATE 6/5/96

PAY ONE THOUSAND FOUR HUNDRED FIFTY AND 98/100************ DOLLARS $1,450.98*****

TO THE ORDER OF

LANE AND RODERICK, INC.

WESTERN METAL LATH

⑈001133⑈ ⑆042202044⑆ 770982529⑈

REMITTANCE STATEMENT

DATE	NUMBER	DESCRIPTION	ACCT. NO.	GROSS AMOUNT	DEDUCTIONS	NET AMOUNT
		SEE ATTACHED	41080500	1450.98		1450.98

Printed on recycled paper to protect the environment.

DETACH BEFORE DEPOSITING

WESTERN METAL LATH
6510 GENERAL DRIVE, RIVERSIDE, CA 92509
(909) 360-3500

GBF 9G-73G

Exhibit 23

RADCO
• CERTIFICATION • LISTING
• TESTING • INSPECTION

RESOURCES
APPLICATIONS
DESIGNS &
CONTROLS, INC.

3220 E. 59TH STREET
LONG BEACH, CA 90805
TELEPHONE: (310) 272-7231
TELECOPIER: (310) 529-7513

June 14, 1996

Mr. Darrell Meyer
Trussteel
18 Vista Encanta
San Clemente, CA 92672

Re: RADCO Proposal PR-T6074

Dear Mr. Meyer:

Based on our discussions on June 12, 1996, we will schedule an R&D test of your steel trusses as follows.

1. Trussteel will furnish all materials, including trusses, decking, cross bracing and fasteners.

2. RADCO will provide the supports for each end of the truss assembly.

3. Trussteel will arrange, at Trussteel cost, for the delivery and pickup of lead ingots for use as dead weights.

The test will be performed on only one assembly, consisting of three trusses at 24" oc by approximately 20 feet long. The test procedure will be essentially in accordance with ASTM E 73, Static Load Testing of Truss Assemblies.

The test sequence will be:

1. Load the assembly to dead load in two increments. Take deflection measurements.
2. Load the live load in four increments, with five minutes between each increment. Take deflection readings after each increment.
3. Unload the assembly, allow it to recover, and take deflection readings.
4. Reload the dead and live load in four equal increments, and then continue loading until 2 ½ times live load is reached.

The cost for this test is $1200.00.

Two copies of this letter are enclosed. Please indicate your acceptance of this proposal by signing one copy below and returning it with your check for $600.00. The balance will be due upon completion of the test.

Sincerely,

RADCO

R.F. Tucker, P.E.
President

RFT/mdc

ACCEPTED:
Trussteel

By: Darrell B Meyer

Date: 6-20-96

FRONT/PROP/PR-T6074

Exhibit 24

TRUSSTEEL

June 18, 1996

Mr. Donald R. Moody, P. E., President, C.E.O.
Western Metal Lath
6510 General Drive, CA 92509

Re: Trussteel floor joist static load test

Dear Don:

All necessary arrangements have been made for the testing of the 3-20' floor joistsat the facilities of RADCO, Long Beach, CA, per their proposal enclosed.

The budget items are itemized below:

RADCO test	$1,200
Rental of 12,000 lbs. lead	600
Freight to deliver & pick-up lead	504
Welding of 3 joists (Janda)	195
Labor	150
Plywood & fasteners	140
Hat channel & flat strap	20
Labor to load & unload lead, set up	200
	$3,059

Per agreement, please remit a check in the amount of $3,000 to Darrell G. Meyer and I will proceed with the test schedule per your request for the week of June 24,1996.

Ilook forward to our test results and a great future.

Very truly yours,

Darrell G. Meyer

DGM:BM

18 VISTA ENCANTA,SAN CLEMENTE, CA 92672

eschubel25

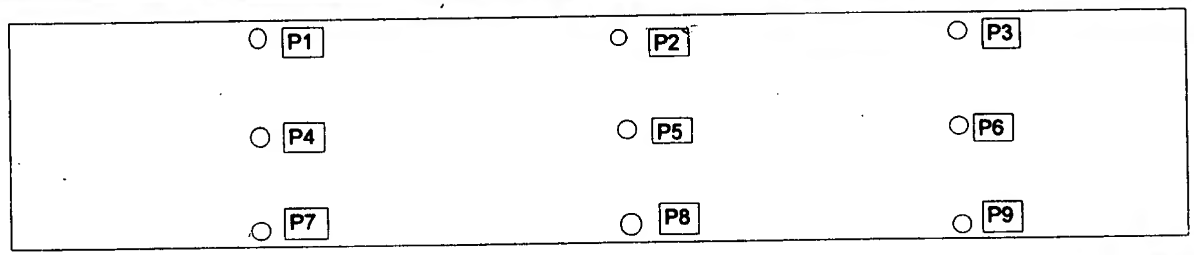
PRELIMINARY

CLIENT:TRUSSTEEL

PRELIMINARY

STATIC LOAD TESTING OF TRUSS ASSEMBLIES, ASTM E-73-83 (reapproved 1991)

Date:	Jul 3, 1996
Time:	1:30 PM
Specimen Size:	4ft.x19ft.8" (236")
Wt. of Lead Ingots	70 lbs. each
Specimen Type:	Steel Truss
Actual Loading Area:	118 sq. ft.
Failure Load: (lbs.)	8400
Failure Load: (psf)	71.186



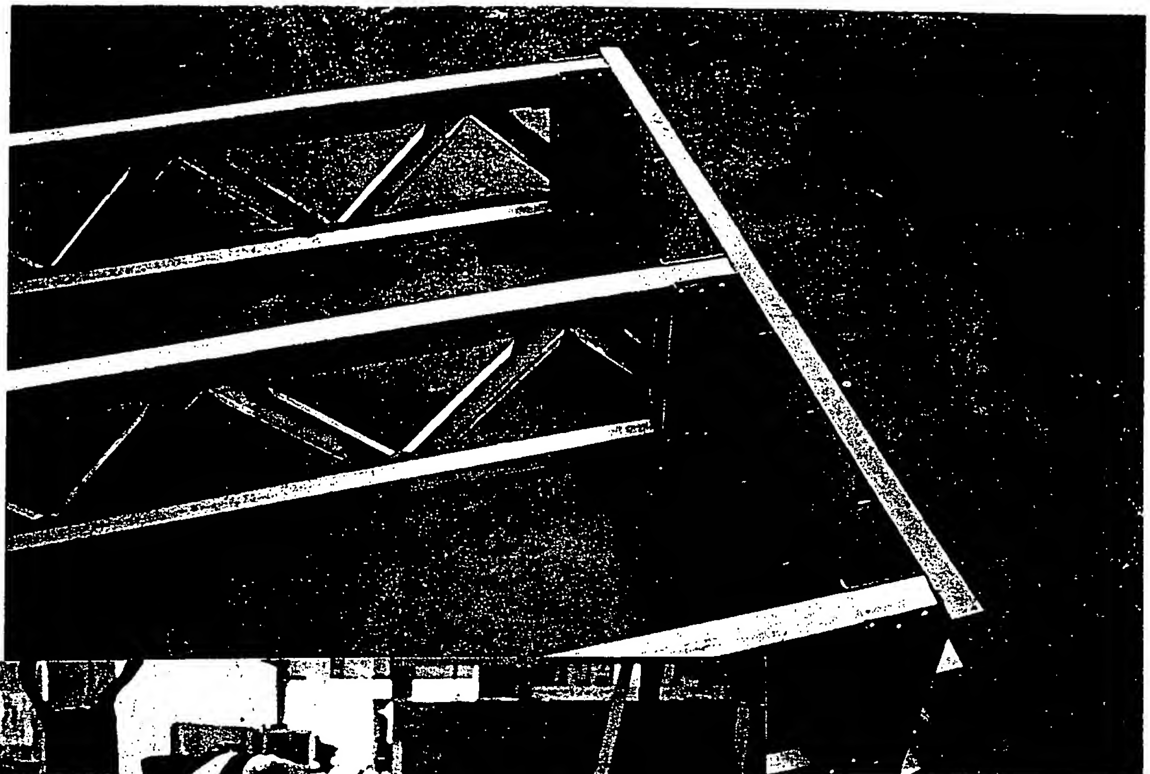
Applied Load		Deflections (in.)									Actual Load	
Live load increments	psf (nominal)	P1	P2	P3	P4	P5	P6	P7	P8	P9	lbs.	psf
Initial (zero load)	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
0.25 Live Load	10 psf	0.1179	0.1700	0.1251	0.1245	0.1747	0.1381	0.1340	0.1820	0.1360	1260	10.678
After 5 min. hold		0.1181	0.1700	0.1251	0.1252	0.1747	0.1381	0.1340	0.1820	0.1360		
0.5 Live Load	20 psf	0.2414	0.3424	0.2514	0.2594	0.3501	0.2727	0.2480	0.3500	0.2630	2520	21.356
After 5 min. hold		0.2442	0.3441	0.2531	0.2619	0.3515	0.2754	0.2450	0.3520	0.2640		
0.75 Live Load	30 psf	0.3613	0.5024	0.3694	0.3858	0.5235	0.4061	0.3750	0.5320	0.3970	3780	32.034
After 5 min. hold		0.3648	0.5053	0.3712	0.3878	0.5239	0.4086	0.3770	0.5350	0.3980		
Live Load	40 psf	0.4917	0.6762	0.4986	0.5187	0.6987	0.5399	0.4920	0.6950	0.5160	4830	40.932
After 5 min. hold		0.4973	0.6840	0.5047	0.5234	0.7022	0.5448	0.4950	0.6990	0.5170		
Load Removed	Zero Load	0.0530	0.0490	0.0434	0.0131	0.0341	0.0337	0.0170	0.0290	0.0180	0	0
After 5 min. hold		0.0342	0.0490	0.0414	0.0123	0.0328	0.0329	0.0150	0.0290	0.0170		
Live Load	40 psf	0.5174	0.6761	0.5086	0.5294	0.7138	0.5506	0.5000	0.7170	0.5050	4830	40.932
After 5 min. hold		0.5183	0.6770	0.5095	0.5303	0.7149	0.5513	0.5020	0.7200	0.5070		
1.50 Live Load	60 psf	0.7678	0.9551	0.7634	0.7861	1.0518	0.8132	0.7320	1.0340	0.7370	7350	62.288
After 5 min. hold		0.7757	0.9636	0.7757	0.7939	1.0619	0.8225	0.7390	1.0430	0.7420		

Mode of Failure:

One web 20" from one end (the full web end) on one outer truss started to deform and buckle when an evenly distributed load of 120 pcs. was applied. i.e 8400 lbs or 71.186 psf.

A second web 39" from the same end (the full web end) on the same outer truss started to deform and buckle when an evenly distributed load of 126 pcs. was applied i.e. 8820 lbs. or 74.746 psf. The test was concluded at this point.

PRELIMINARY



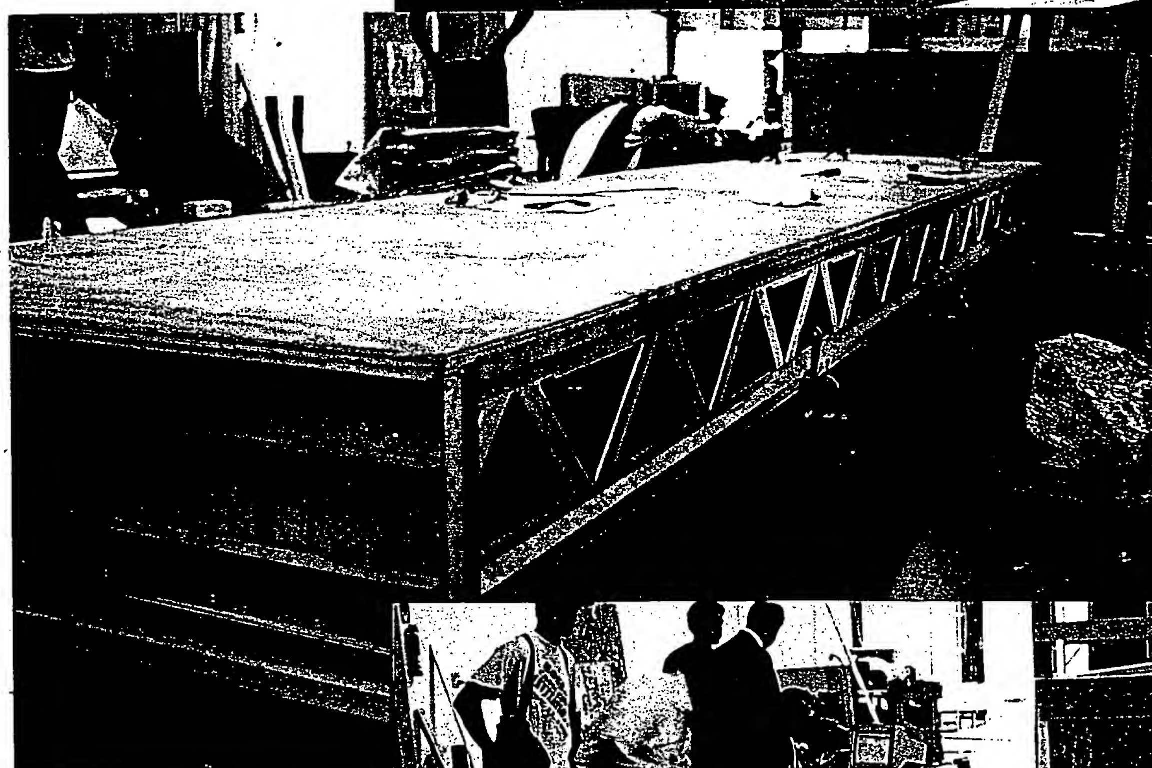


exhibit 26

20 GA TRUSS

SPAN = 17'-3"

DL = 10 PSF
LL = 40 PSF
SPACING = 24" o/c

TOP CHORD: $M = .0551\ 'k$

$P = 4.335^k$

$P_{ALL} = 4.37^k > 4.335^k$ ok!

BOT. CHORD: $M = 0.0468\ 'k$

$T = 4.365^k$

$T_{ALL} = 6.9^k > 4.365^k$ ok!

WEB (AT WEAKEST SECTION)

$P_{MAX} = 1.2^k$

$P_{ALL} = 1.5^k > P_{MAX}$ ok!

$\Delta_{TL} = .579'' = \frac{L}{358} > \frac{L}{240}$ OK!

$\Delta_{LL} = .463'' = \frac{L}{447} > \frac{L}{360}$ OK!

GOUVIS ENGINEERING

Sht 2
J.N. G- 12250
Date 7/96
Client METER

18 GA TRUSS

SPAN = 20'-3"

DL = 10 PSF
LL = 40 PSF
SPACING = 24" o/c

TOP CHORD:

$M = .0706\ 'k$

$P = 5.97^k$

$P_{ALL} = 6.05^k > 5.97^k$ OK!

BOT. CHORD: OK PER INSP.

WEB:

$P_{MAX} = 1.75^k$

$P_{ALL} = 2.1^k > 1.75^k$ OK!

$\Delta_{TL} = .826'' = \frac{L}{294} < \frac{L}{240}$ OK!

$\Delta_{LL} = .661'' = \frac{L}{367} < \frac{L}{360}$ OK!

GOUVIS ENGINEERING

Sht 3
J.N. G- 12250
Date
Client

20 GA TRUSS

SPACING = 12" o/c

1)

$$\frac{(40)\ L^4}{(80)(17.25)^4} = \frac{(L/360)(12)}{.463}$$

L = 23.36' → GOVERNS

2)

$$\frac{50\,(L)^2}{100\,(17.25)^2} = \frac{4.37}{4.34}$$

L = 24.48'

3)

$$\frac{\frac{1}{2}(50)(L)}{\frac{1}{2}(100)(17.25)} = 1$$

L = 34.5'

$$\boxed{L_{ALLOW} = 23'\text{-}4''}$$

GOUVIS ENGINEERING

Sht 4
J.N. G-12250
Date
Client

<u>20 GA TRUSS</u>

SPACING = 16" o/c

1) $$L = \sqrt[3]{\frac{80}{53.3}(6374.6)} = 21.23'$$ ← GOVERNS

2) $$L = \sqrt{\frac{100}{66.7}(299.6)} = 21.0'$$

3) $$L = \frac{100}{66.7}(17.25) = 25.9'$$

$$\boxed{L_{ALLOW} = 21'\text{-}4''}$$

GOUVIS ENGINEERING

Sht 5
J.N. G- 12250
Date
Client

20 GA TRUSS

19.2" O/C

1) $L = \sqrt[3]{\frac{1}{.8}(6374.6)} = 20.0'$

2) $L = \sqrt{(1.25)(299.6)} = 19.35'$ ← GOVERNS

3) $L = (1.25)(17.25) = 21.56'$

$\boxed{L_{ALLOW} = 19'\text{-}3"}$

18 GA TRUSS

SPACING = 12" O/C

1)

$$L = \sqrt[3]{2(8479.6)} = 25.69'$$ ← GOVERNS

2)

$$\frac{(L)^2}{2(20.25)^2} = \frac{6.05}{5.97}$$

$$L = \sqrt{(2)(415.6)} = 28.83'$$

3)

$$L = (2)(20.25) = 40.50'$$

$$\boxed{L_{ALLOW} = 25'\text{-}8''}$$

GOUVIS ENGINEERING

Sht 7
J.N. G- 12250
Date
Client

18 GA TRUSS

SPACING = 16" o/c

1) $L = \sqrt[3]{1.5(8479.6)} = 23.34'$ ← GOVERNS

2) $L = \sqrt{1.5(415.6)} = 24.97'$

3) $L = 1.5(20.25) = 30.38'$

$L_{ALLOW} = 23'-4"$

GOUVIS ENGINEERING

Sht 8
J.N. G- 12250
Date
Client

18 GA TRUSS

19.2" O/C

1) $L = \sqrt[3]{1.25(8479.6)} = 21.97'$ ← GOVERNS

2) $L = \sqrt{1.25(415.6)} = 22.79'$

3) $L = 1.25(20.25) = 25.3'$

$\boxed{L_{ALLOW} = 22'\text{-}0''}$

exhibit 27

QUOTATION

Tel: (310) 949-2446
Toll Free: 800-282-6285
FAX: (310) 942-0624

National Machinery Exchange, Inc.

Wire and Metal Working Machinery
WEST COAST DIVISION
7805 Paramount Blvd., Pico Rivera, CA 90660 (USA)

Darryl Meyer
TRUSTEEL MFG.
18 Vista Encante
San Clemente CA 92672

Date: 08/06/96
Ref#: 28446

Mach: 100194

Tel : 714-285-1004
FAX : 714-285-1369

We are pleased to offer the following for your consideration:

ONE (1) USED
WARCO MOMDEL #SC2-200-54-54E STRAIGHT SIDE DOUBLE CRANK PRESS

Rated capacity	200 tons
Stroke of Slide	6"
Slide Adjustment	6" (Power)
Shut Height	20" SDAU
Strokes Per Minute	33 to 70
Area of Bed	54-1/2" x 54"
Area of Slide	54" x 54" T-Slot
Windows	38-3/4" x 10-3/4"
Boslter	54" x 54" x 6" (T-slot)

EQUIPPED WITH:

Air Clutch
Air Counter Balance
40 HP Main Motor

Overall Dimensions: 9' x 10' x 15'6"
Weight: 52,000 #

PRICE: $69,500.00

"If It's Machinery, We Have It!"

National Machinery Exchange, Inc.

Bob Goodspeed

QUOTATION

Tel: (310) 949-2446
Toll Free: 800-282-6285
FAX: (310) 942-0624

National Machinery Exchange, Inc.

Wire and Metal Working Machinery
WEST COAST DIVISION
7805 Paramount Blvd., Pico Rivera, CA 90660 (USA)

Darryl Meyer
TRUSTEEL MFG.
18 Vista Encante
San Clemente CA 92672

Date: 08/06/96
Ref#: 28445

Mach: 101655

Tel : 714-285-1004
FAX : 714-285-1369

We are pleased to offer the following for your consideration:

ONE (1) USED
BLISS MODEL #S2-150-60-36 2-POINT STRAIGHT SIDE DOUBLE CRANK PRESS

TIE ROD FRAME ------ SINGLE BACK GEARED

Rated Capacity	150 Tons
Stroke of slide	10"
Shutheight	23-1/2"
Ram Adjustment	8"
Ram Area ....(l-r x f-b).............	60" x 36"
Ram Plate ....(l-r x f-b x h).........	60" x 36" x 4"H T-Slotted
Bolster ....(l-r x f-b x h).........	60" x 36" x 2-1/2"
Side Frame Opening .....(l-r x high)............	19" x 15"
Strokes per Minute	35
Width between Uprights	66"

Air Clutch on Flywheel
15 HP 3/220-440/60 Motor
Flywheel V-Belt
One-Shot Lubrication System

(2) Air Cushions 2,5 tons w/5" travel
Air Counterbalance
Palm Button Controls
Motor mounted on top

PRICE: $49,500.00

"If It's Machinery, We Have It!"

National Machinery Exchange, Inc.

Bob Goodspeed

QUOTATION

Tel: (310) 949-2446
Toll Free: 800-282-6285
FAX: (310) 942-0624

National Machinery Exchange, Inc.
Wire and Metal Working Machinery
WEST COAST DIVISION
7805 Paramount Blvd., Pico Rivera, CA 90660 (USA)

Darryl Meyer
TRUSTEEL MFG.
18 Vista Encante
San Clemente CA 92672

Date: 08/06/96
Ref#: 28444

Mach: 57716

Tel : 714-285-1004
FAX : 714-285-1369

We are pleased to offer the following for your consideration:

ONE (1) USED
BLISS MODEL #6-60W STRAIGHT SIDE DOUBLE CRANK TIE ROD DESIGN PRESS

RATED CAPACITY..........................135 TONS
GEARED..................................DOUBLE BACK
STROKE OF SLIDE.........................8"
SHUTHEIGHT..............................18-1/2"
ADJUSTMENT..............................3"
BED AREA................................60" L-R X 42" F-B
RAM AREA................................54-1/2" L-R X 34" F-B
BOLSTER AREA............................60" L-R X 42" F-B X 4-1/2" H
SIDE FRAME OPENINGS.....................12" L-R X 10" H
DISTANCE BETWEEN UPRIGHTS...............61"
SHAFT...................................5-3/4"
SPEEDS: STROKES PER MINUTE..............20

EQUIPPED WITH:

AIR CLUTCH
TWIN END DRIVE
FLYWHEEL "V" BELT
AIR COUNTERBALANCE TO RAM
AIR CUSHION IN BED MARQUETTE TYPE 18" DIAMETER X 6" STROKE
POWER RAM ADJUSTMENT
15 HP 3/60/220-440 (1755 RPM) MOTOR

PRICE: $24,500.00

"If It's Machinery, We Have It!"

National Machinery Exchange, Inc.

Bob Goodspeed

QUOTATION

Tel: (310) 949-2446
Toll Free: 800-282-6285
FAX: (310) 942-0624

National Machinery Exchange, Inc.

Wire and Metal Working Machinery
WEST COAST DIVISION
7805 Paramount Blvd., Pico Rivera, CA 90660 (USA)

Date: 08/06/96
Ref#: 28442

Mach: 58335

Tel : 714-285-1004
FAX : 714-285-1369

Darryl Meyer
TRUSTEEL MFG.
18 Vista Encante
San Clemente CA 92672

We are pleased to offer the following for your consideration:

ONE (1) USED
BLISS-TOLEDO MODEL #93-1/2 STRAIGHT SIDE DOUBLE CRANK PRESS

RATED CAPACITY (TONS)	126
GEARED	SINGLE BACK
STROKE OF SLIDE	10"
SHUTHEIGHT	30"
BOLSTER	4"
RAM ADJUSTMENT	3-1/2"
WINDOWS (L-R X HIGH)	12" X 15"
SPEEDS: STROKES PER MINUTE	32
BED AREA (L-R X F-B)	67" X 36"
RAM AREA (L-R X F-B)	60" X 25"

EQUIPPED WITH:

AIR CLUTCH
AIR COUNTERBALANCE TO RAM
ONE SHOT LUBE SYSTEM
TWIN END DRIVE
AC MOTOR AND CONTROLS

PRICE: $17,000.00

"If It's Machinery, We Have It!"

National Machinery Exchange, Inc.

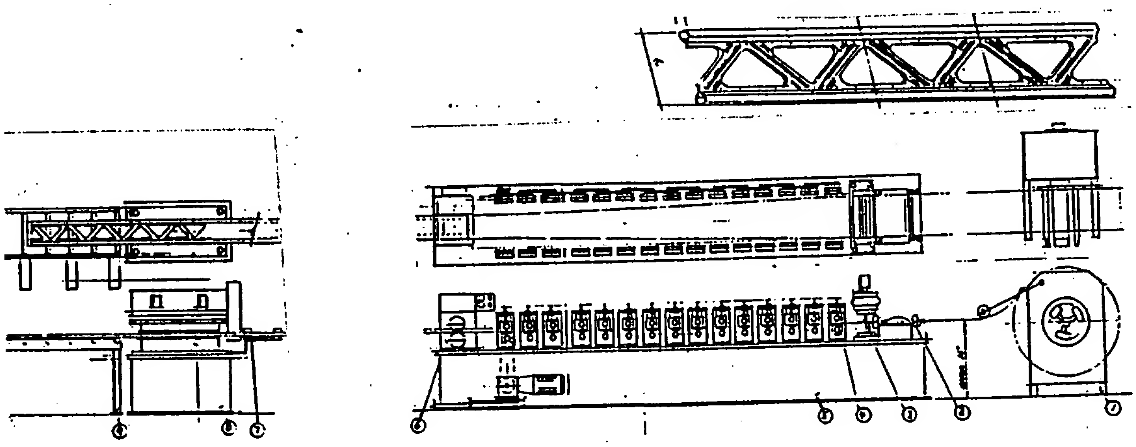
Bob Goodspeed

exhibit 28

TONY LUCAS
979-7080

AL ENGINEERING, INC.
2697 S. Halladay St., Santa Ana, CA 92705
(714) 979-5940 • FAX (714) 979-1617

Qty.	Name of Part	Due:	Date:	Customer:
1-LINE	ROLLFORM LINE FOR: 12 × 1½ STRUCTURAL JOIST	APPROX. 26 WKS	8-19-96	TRUS STEEL
		Tax: YES / NO	Person: MR. DARRELL MEYER	
Part #	Process: SPEC. MACHINE		Phone: (714) 3619295	
			FAX: (") 2851004	
Mat. STEEL: 18 + 20 GA. × 21.5" × COIL			P.O.#:	

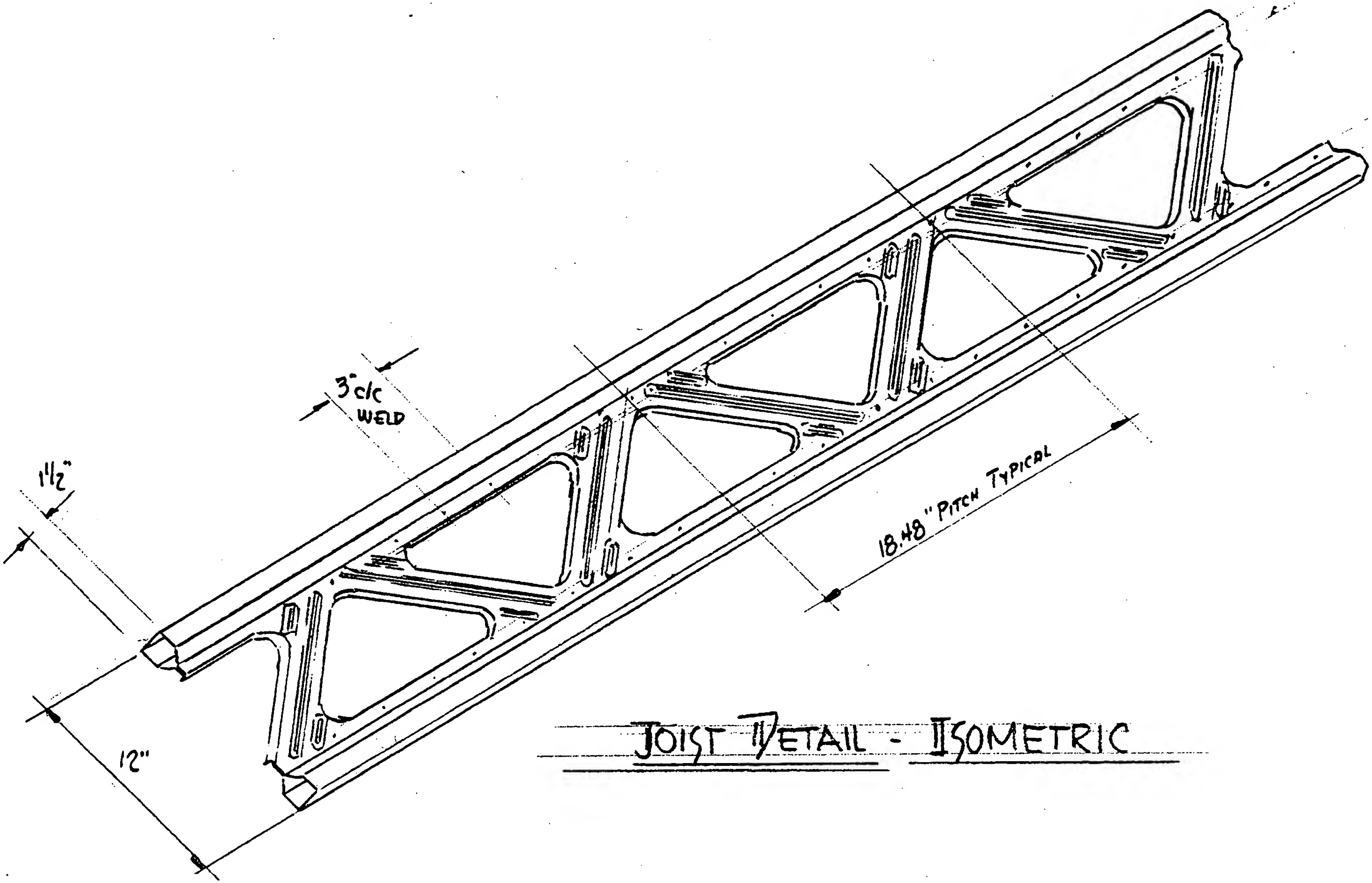


1. UNCOILER: 20,000 lbs. HYDR. + MOTORIZED
2. HUMPTABLE + PINCH STATION
3. PREPUNCH PRESS
   — " — CUT OFF SHEAR
4. FORM ROLLS: HT. TR.
5. ROLL FORMER: 2×24 – 15
6. WELD STATION: (ROTARY)
7. FEED STATION (SPECIAL)
8. PUNCH PRESS:
   PROGRESSIVE DIE: (PIERCE + FORM)
9. RUNOUT TABLE (40 FT lg)
   PACKAGING (SIDE STEPPING)
10. ENGINEERING + DEBUGGING

NOTES:
1. CUSTOMER TO SUPPLY ALL TRYOUT MATLS.
2. TERMS: 1/3 DOWN WITH P.O.
   1/3 AFTER 6 WKS
   BAL. UPON COMPL. AND ACCEPTANCE IN OUR PLANT.

TOTAL 493,100.–

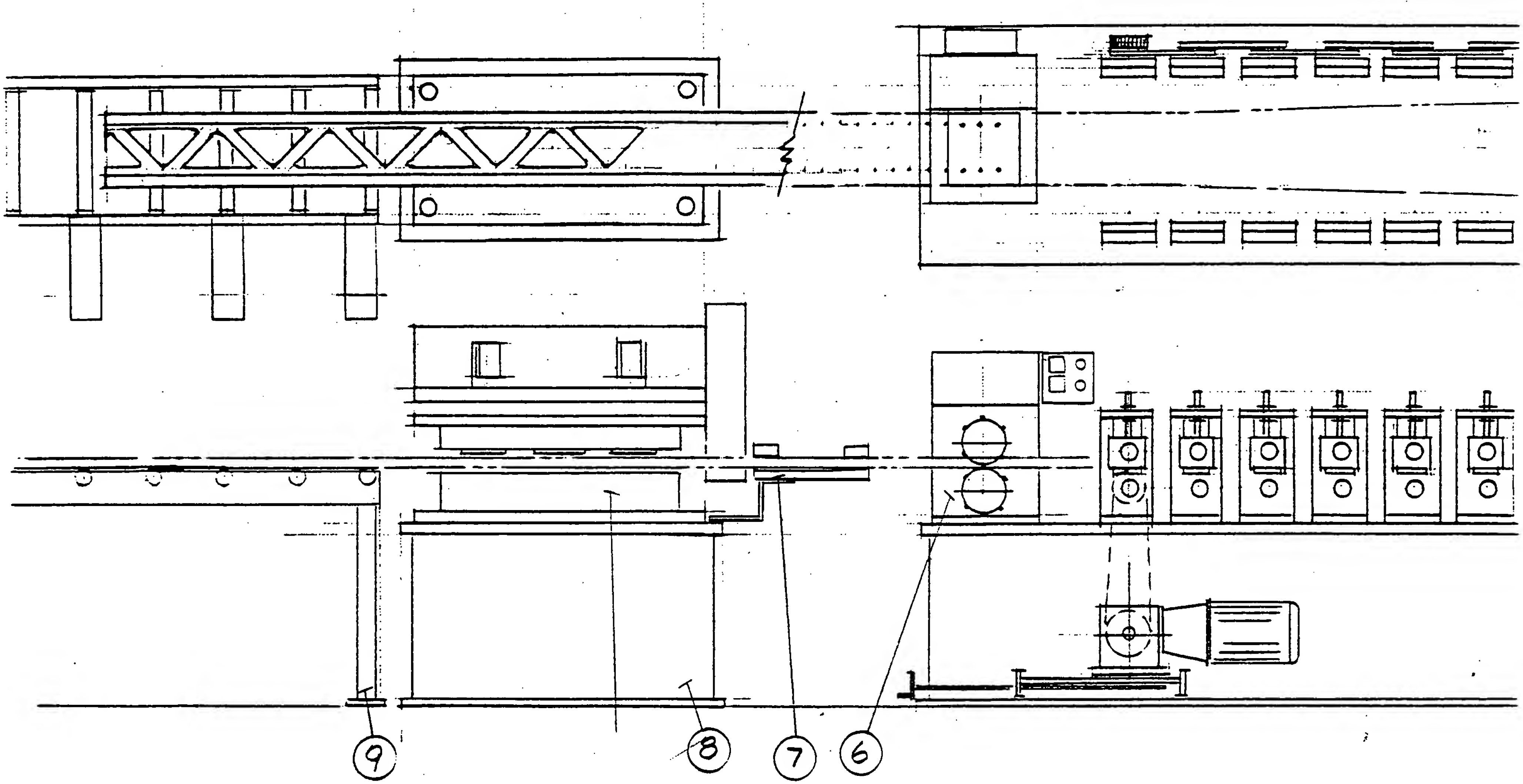
F.O.B. OUR PLANT SANTA ANA, CA.



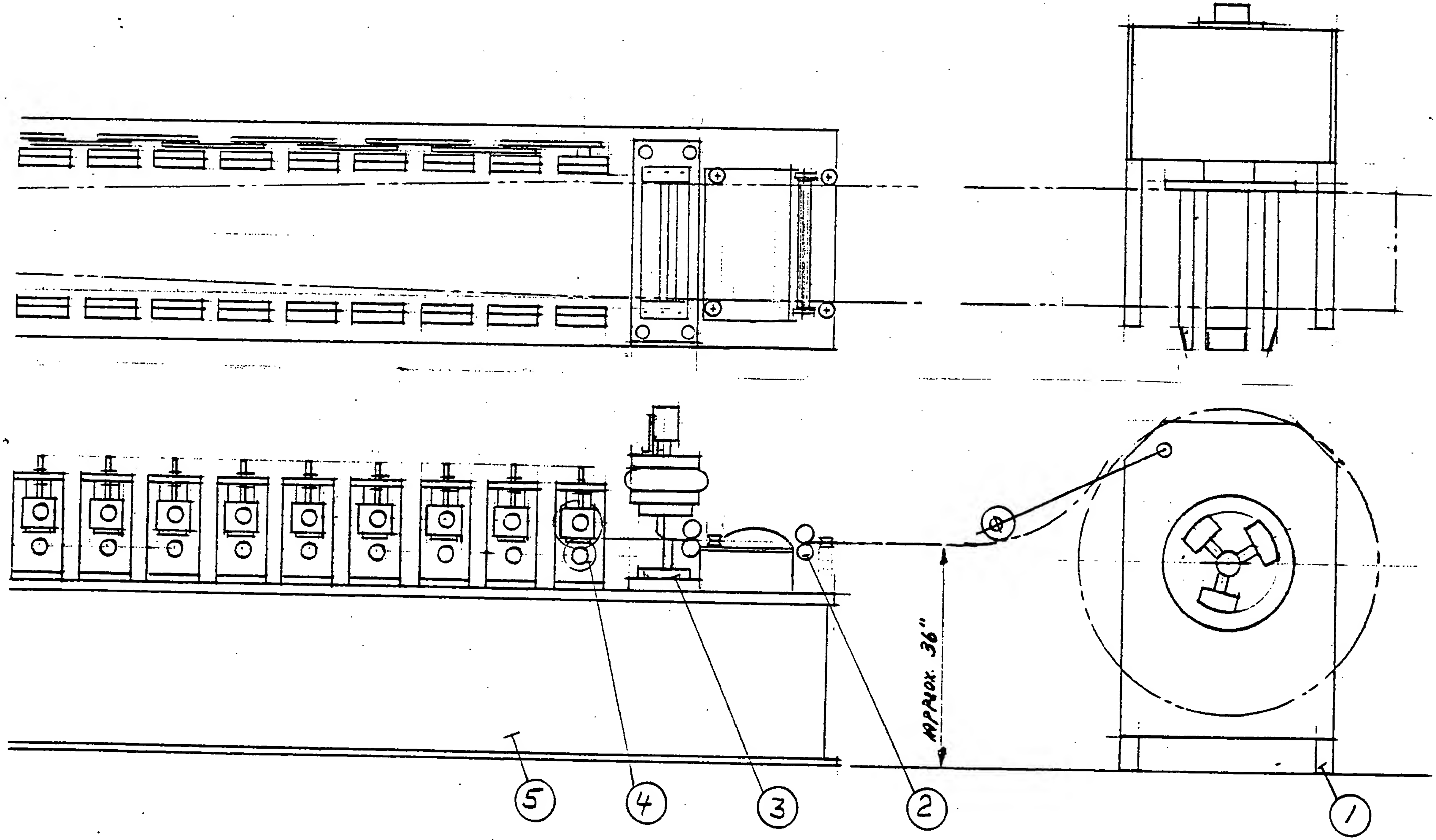
JOIST DETAIL - ISOMETRIC

AL ENGINEERING, INC.
2697 So. Halladay St.
Santa Ana, CA 92705
(714) 979-5940

8-19-96



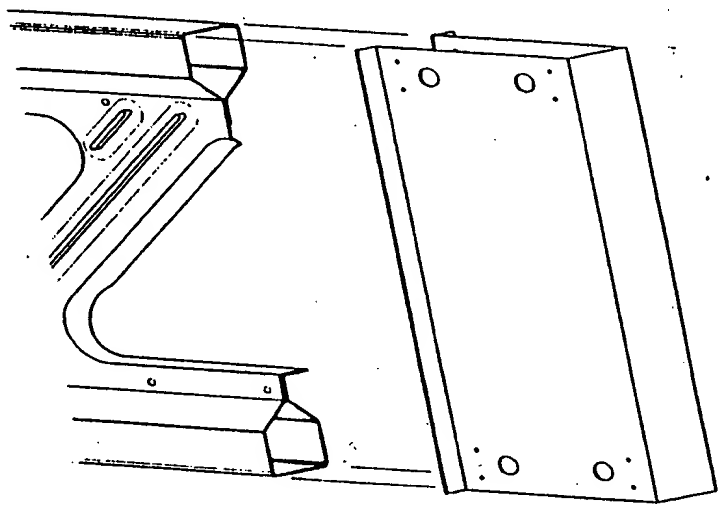
9
8
7
6



AL ENGINEERING, INC.
2697 So. Halladay St.
Santa Ana, CA 92705
(714) 979-5940

AL ENGINEERING, INC.
2697 S. Halladay St., Santa Ana, CA 92705
(714) 979-5940 • FAX (714) 979-1617

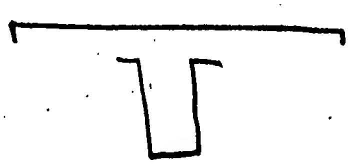
Qty. 1	Name of Part TOOLING FOR: "TRUSS ENDS"	Due: 8 WKS Tax: ☒ YES ☐ NO	Date: 8-19-96 Person: MR. DARRELL MEYER	Customer: TRUS STEEL
Part #	Process TOOLING		Phone (714) 361 9295 FAX: " 2851004	
Mat.			P.O.#:	



1. TO DIE DESIGN:

a. BLANK DIE. (PIERCE + CUT OFF) — 4,500 —

b. DBL. FORM DIE. — 3,500 —



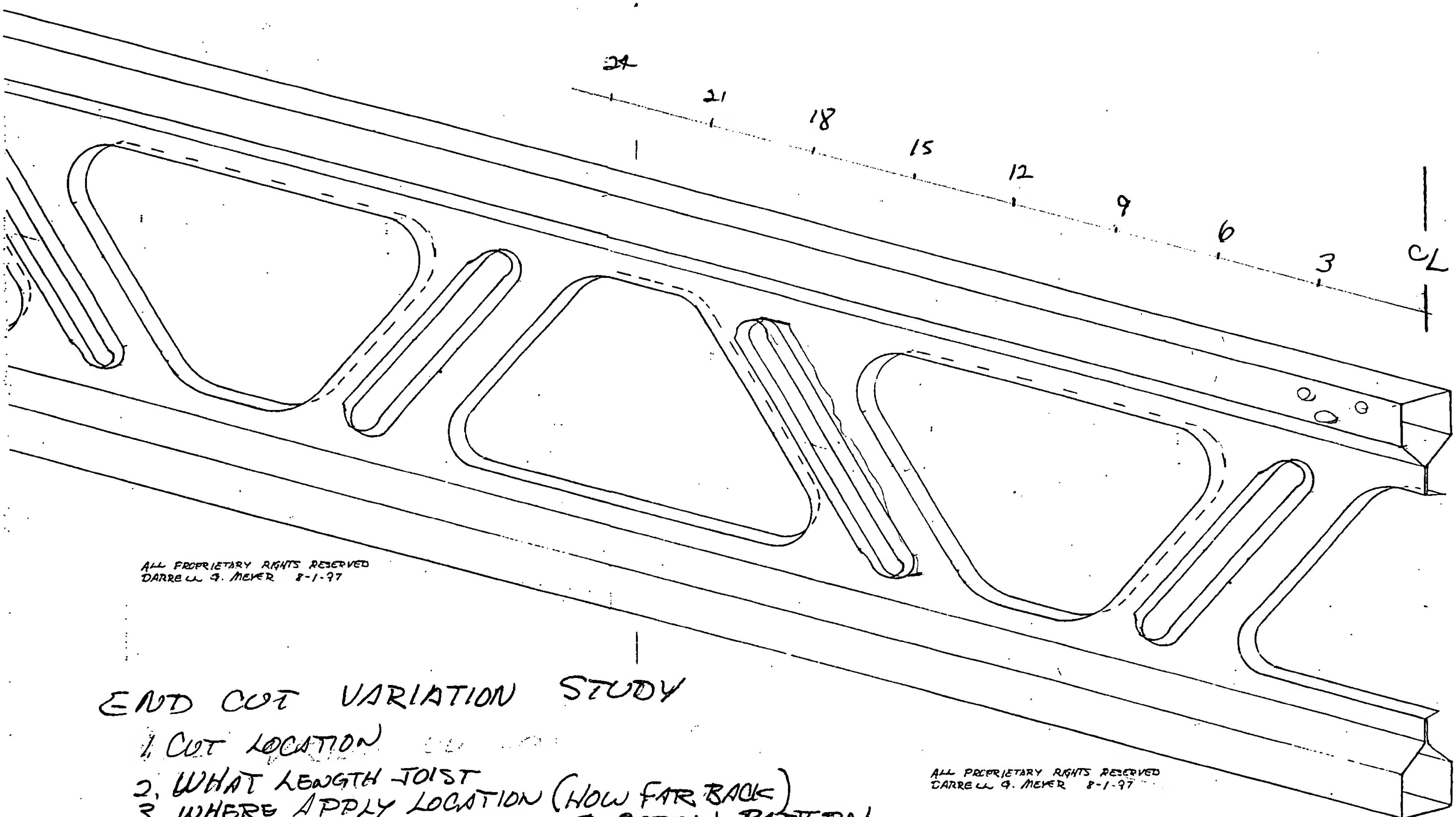
NOTES:

TOTAL 8,000.-

F.O.B.

exhibit 29

NOTE! REVERSING FLANGE DIRECTION — "TOO COMPLEX IN DIE DESIGN"



END CUT VARIATION STUDY

1. CUT LOCATION
2. WHAT LENGTH JOIST
3. WHERE APPLY LOCATION (HOW FAR BACK)
4. USE END CAP W SAME 3 SCREW PATTERN

ALL PROPRIETARY RIGHTS RESERVED
DARRELL G. MEYER 8-1-97

SteelIJoist

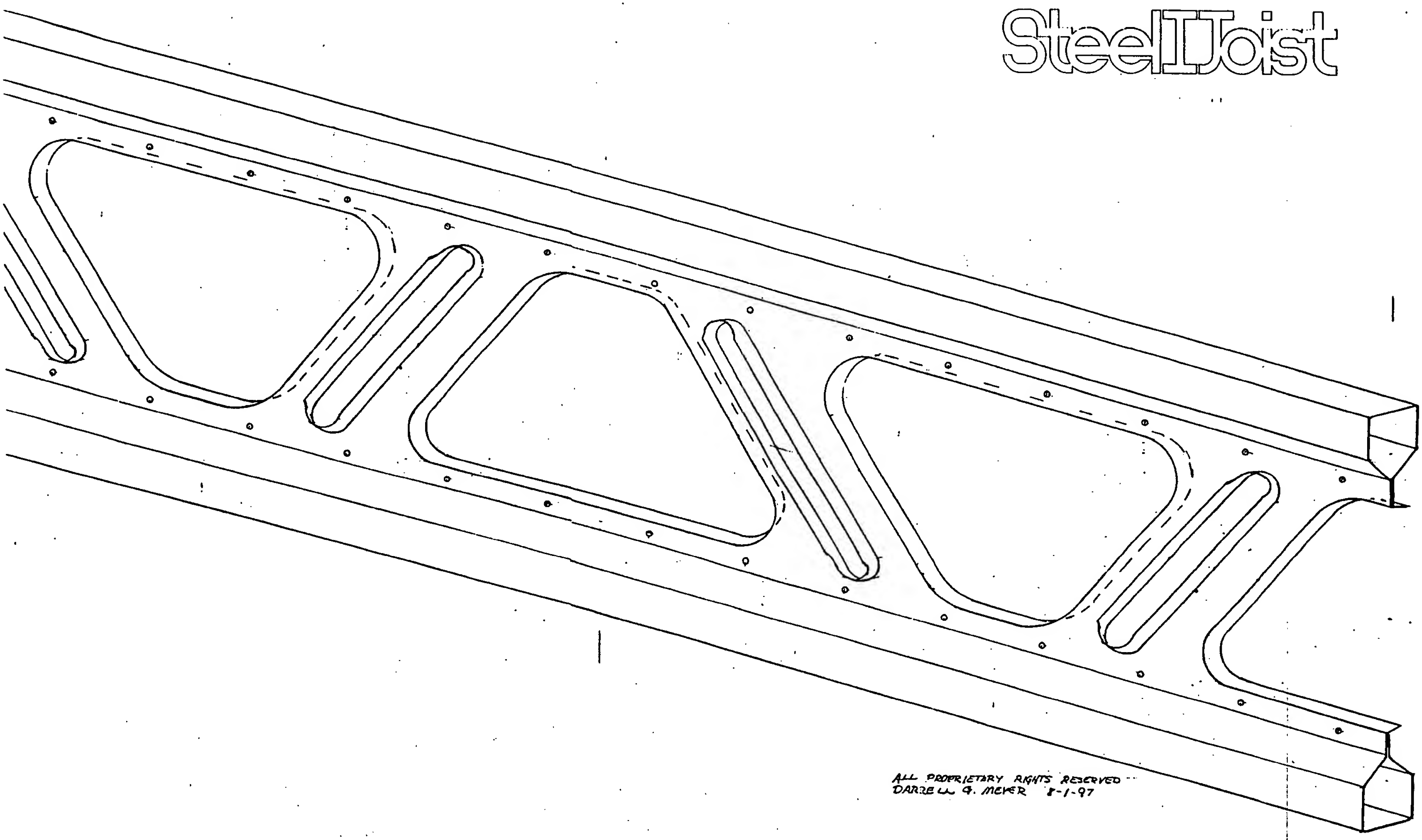


exhibit 30

QUOTATION

Tel: (310) 949-2446
Toll Free: 800-282-6285
FAX: (310) 942-0624

National Machinery Exchange, Inc.

Wire and Metal Working Machinery
WEST COAST DIVISION
7805 Paramount Blvd., Pico Rivera, CA 90660 (USA)

Darryl Meyer
TRUSTEEL MFG.
18 Vista Encante
San Clemente CA 92672

Date: 01/07/98
Ref#: 41392

Mach: 101816

Tel : 714-285-1004
FAX : 714-285-1369

We are pleased to offer the following for your consideration:

ONE (1) USED

YODER 15 STAND ROLL FORMER

ARBOR DIAMETER .... 2-1/2"
MAXIMUM WIDTH BETWEEN HOUSINGS .... 27-1/2"
HORIZONTAL DISTANCE BETWEEN CENTERS .... 20-1/2"
MAXIMUM VERTICAL DISTANCE BETWEEN CENTERS ...... 10.8"

EQUIPPED WITH: ADJUSTABLE ENTRY EDGE GUIDE SIDE PLATES MOUNTED ON IDLER ROLL STAND
EDGE GUIDE ROLL STAND ADJUSTED VIA HAND CRANK SCREW
OUTBOARD HOUSING BASES BOLTED TO T-SLOTS IN MACHINE BED TO HOLD THEM INTO POSITION
DIRECTION OF FLOW: LEFT TO RIGHT
40 KW 3/230-380/50 (1450 RPM) 133/77 AMP MOTOR
ELECTRIC BRAKE

PRICE: $62,500.00

"If It's Machinery, We Have It!"

National Machinery Exchange, Inc.

Bob Goodspeed

QUOTATION

Tel: (310) 949-2446
Toll Free: 800-282-6285
FAX: (310) 942-0624

National Machinery Exchange, Inc.
Wire and Metal Working Machinery
WEST COAST DIVISION
7805 Paramount Blvd., Pico Rivera, CA 90660 (USA)

Darryl Meyer
TRUSTEEL MFG.
18 Vista Encante
San Clemente CA 92672

Date: 01/07/98
Ref#: 41391

Mach: 102512

Tel : 714-285-1004
FAX : 714-285-1369

We are pleased to offer the following for your consideration:

ONE (1) USED

LOCKFORMER 12 STAND ROLL FORMER

ARBOR DIAMETER .... 3"
HORIZONTAL CENTERLINE DISTANCE .... 20"
VERTICAL CENTERLINE DISTANCE .... 7" MINIMUM
.... 10-1/2"
DISTANCE BETWEEN HOUSINGS .... 30"
O.A. DIMENSIONS .... 24"3" LR X 5'7" FB X 4'11" HIGH

EQUIPPED WITH: RIGHT TO LEFT ENTRY FLOW
ENTRY EDGE GUIDE
MOTOR

PRICE: $42,500.00

"If It's Machinery, We Have It!"

National Machinery Exchange, Inc.

Bob Goodspeed

QUOTATION

Tel: (310) 949-2446
Toll Free: 800-282-6285
FAX: (310) 942-0624

National Machinery Exchange, Inc.
Wire and Metal Working Machinery
WEST COAST DIVISION
7805 Paramount Blvd., Pico Rivera, CA 90660 (USA)

Darryl Meyer
TRUSTEEL MFG.
18 Vista Encante
San Clemente CA 92672

Date: 01/07/98
Ref#: 41390

Mach: 103332

Tel : 714-285-1004
FAX : 714-285-1369

We are pleased to offer the following for your consideration:

ONE (1) USED

McKAY 10 STAND ROLL FORMER

Shaft diameter .... 3"
Roll space .... 16"
Horizontal centers .... 17"
Vertical adjustment .... 6"
Horsepower gear drive 40

PRICE: $72,500.00

"If It's Machinery, We Have It!"

National Machinery Exchange, Inc.

Bob Goodspeed

exhibit 31

AMERICAN
MACHINE & ROLLFORM TECH, INC.

January 8, 1998

Mr. Darrell Meyer
Steelworks
1801 Parkcourt Building E 200
Santa Ana, CA 92701

Dear Mr. Meyer,

The first to build a fast and reliable flying hydraulic punch and cutoff; American Machine & Rollform Tech, Inc. has continued to be an innovator in hydraulic technology in the rollforming industry for over 15 years. In line with that progress we are ready to introduce into the market place our complete rollforming system to include the high performance American Machine rollformer.

While the "flying" press allows you to maintain a constant line speed without stopping to punch or cut your product, the rollformer with its double enveloping worm and worm gear provides high shock resistance for heavy load starting and stopping. By providing extra torque capacity, low backlash, and increased durability, this design will provide more years of higher productivity than straight worm gear designs.

One of the key reasons American Machine has been a leader in the rollform industry is your production output will remain consistent, precise, and predictable, delivering line speeds in excess of 300 FPM. As part of The Bradbury Group of companies we offer you our specific and unique set of technical skills and experience along with the united capabilities of all our companies within the group.
We obviously want an opportunity to earn your business and trust that you will consider us as a serious and viable option for future equipment needs. I look forward to talking with you regarding our equipment specifications.

Sincerely,

Rob Booth

Robert P. Booth
Sales Coordinator

Enclosures

AMERICAN
MACHINE & ROLLFORM TECH, INC.

J. B. Leahy

@ ATLANTA

2771 Pence Loop SE
Salem OR 97302
503-588-2638 Fax 503-588-4029
E-mail: jbleah@americanmachine.com

THE BRADBURY GROUP

Exhibit 32

SteelWerks

1801 E. Parkcourt Place
Building E, Suite 200
Santa Ana, CA 92701
(714) 285-1004
Fax (714) 285-1369

March 25, 1998

Mr. Robert Booth
American Machine & Roll Form
2771 Pence Loop SE
Salem, OR 97302

Re: Steel I Joist

Dear Robert,

The Steel I Joist manufacturing line should incorporate these general specifications for the product with your expertise leading the way to determine the most efficient way to achieve our goals.

SPECIFICATIONS:

- Finished Dimensions - 12" High and 1 1/2" Wide
- Steel Grade 50 KSI (+) Zincalume
- Both 18 Gauge and 20 Gauge capacity
- Material width 20.5" (Plus or Minus)
- Pentagon Shaped Chord Sections
- Mechanical Clinch-Fasten to close Chords
- 12" center to center dimension of openings in triangle
- Bend flanges to achieve stiffness in center section - Continuous
- Bend flanges in reverse in slots (If possible)

The roll form line and ancillary stations may be positioned to achieve the following objectives:

- Continuous lengths to 40 feet
- Cut to order increments of 1 foot
- "Factory" end / start of stamped openings
- Mechanical Clinch-Fastener to close Chords may be Wheel Type (Hill Mfg. or Eckold) or Flying Tog-L-Loc (BTM)

- Roll-Form Line probable specs:
  - a. 2 1/2" diameter shafts
  - b. 24" stand clearance
  - c. 14 - 16 stands
- Uncoiler
  - a. Single w rail
  - b. Double
- Welder - Coil Ends
- Stacker - Accumulator
- On-Line stamp openings / Form flange hydraulic
- "Alternative" Off-Line stamp / Flange separate feed - Progressive punch and die

Decisions on machinery locations to best complete the following steps:

- Cut to Length - 1 foot increments
  - a. Prior to entry
  - b. Shear outer 1/3 each side prior to entry, center section after pentagon - Flying cut-off
  - c. After forming and clinching
- Punch triangular opening
- Punch or shear diagonal slots
- Form flanges - Triangle
- Form flanges - Slot

I look forward to your recommendations, proposal and a long relationship.

Sincerely,
Steelworks

Darrell

Darrell G. Meyer

DGM/lw

exhibit 33

SteelWerks

1801 E. Parkcourt Place
Building E, Suite 200
Santa Ana, CA 92701
(714) 285-1004
Fax (714) 285-1369

April 6, 1998

Mr. Al Strecker, Sales Manager
The Bradbury Company
Air Industrial Park
Moundridge, KS 67107

RE: Steel I Joist Rollform Line

Dear Mr. Strecker,

Per our conversation of Friday, April 3, 1998, I enclose preliminary drawing for the manufacture or a residential floor joist. These are the same drawings furnished to Mr. Dan Lovelace and Mr. Robert Booth at our meeting in their offices March, 25, wherein we discussed various methods of production leading to a proposal to build a Rollform Line.

We recognize you as the experts in roll form design, but several options arise as where to best perform functions such as:

- Cut to length
- Cut openings and slot
- Bend flanges, preferably up and down
  - a) On line, after closure, on fly
  - b) Off line, progressive punch and die
- Handling of product flow after roll form (under either condition)

I also enclose a Non-Disclosure Agreement, the execution of which I would appreciate. I hereby acknowledge assurance to you of mutual confidentiality on potential concepts developed for fabrication of this product.

My original design was discussed with Richard Pearson in 1996 and Bradbury generated a proposal. Further engineering and subsequent prototype tests, meetings with I. C. B. O. (International Congress of Building Officials) and concerns about resistance spot welding have led to the current design and specifications.

RDB - fax
503 588 - 4029
THU 4-9 2:00

Mechanically fastening/closing of the pentagon shaped chords on the roll form line with a system that maintains consistent quality that can be monitored and inspected is a prime concern. Two companies have the experience and capability to provide a rotary unit, Hill Engineering and Eckold. Dan and Rob suggested I correspond further with Thomas Grossman and I enclose a copy of my letter to him.

We would welcome your critique of the joist and the best way to manufacture same. I want to be able to obtain an I.C.B.O. number which establishes engineering performance standards that are uniformally recognized. Hopefully, we will do it so well, we will stifle potential knock-offs.

Multiple plants or licensing arrangements are the long range goal with the original plant to be operated here is southern California.

I thank you, Dan and Bob for an opportunity to meet in person at your factory, introducing the H L stud line. I have scheduled a flight and plan to be in your facility Wednesday, April 22, 1998, at 8:30 AM.

I look forward to your initial comments following receipt of this package, developing the system and, of course, meeting all of you on the 22nd.

Respectfully,

Steelworks

Darrell G. Meyer

DGM/lsw

Enclosures

cc: Dan Lovelace, Robert Booth
American Machine

Exhibit 34

SteelWerks

1801 E. Parkcourt Place
Building E, Suite 200
Santa Ana, CA 92701
(714) 285-1004
Fax (714) 285-1369

April 6, 1998

Mr. Thomas Grossman
Eckold A G
CH - 7203 Trimmis
Schweiz, Switzerland

RE: Steel I Joist / Mechanical Joining

Dear Mr. Grossman,

In Atlanta, this past October, we discussed the feasibility of your firm providing a Rotary / Wheel Clinching Machine to be installed on a Roll Form line.

Enclosed is a preliminary drawing showing the cross section of our floor joist, 12" x 1 1/2" with basic specifications.

I am working with American Machine and Bradbury Company on the complete Roll Form Line. Their addresses and phone numbers are listed below.

The fastening system must be able to meet certain engineered load standards to ultimately satisfy I. C. B. O. (International Congress of Building Officials) and allow some method of periodic sampling and inspection.

Multiple plants or licensing arrangements are the long range goal with the original line to be operated here in southern California.

As soon as possible, review our request and advise feasibility, general configuration and dimensions.

I welcome your comments and also feel free to contact the aforementioned companies on the team. Your confidentiality is appreciated.

Steelworks

Darrell G. Meyer

DGM/lw
Enclosures
cc: Craig Leber, USA Agent

FAXED
4-13-98
9:15

exhibit 35.

Tel: (416) 264-5790
Fax:(416)264-5632

SIM-VISION

3233 Eglinton Avenue East.Suite 1109 Toronto, Ontario M1J 3N6

Mr. Meyer

Following is a quotation for an uncoiler for your new roll forming project.

I have built many uncoilers for Kent Corporation in the past and now have an agreement to build both Kent's uncoiler as well as my own design which Kent will often purchase when their own design is oversized for a certain application. In this case I have spoken with Mark Costello at Kent Corporation and he had mentioned that he quoted an uncoiler and coil end welder for your new roll form project with American Machine.

Mark has said that you may buy the entry and coil handing equipment separate to save a little money. Mark also agrees that his uncoiler that he quoted may be way oversized for this application. Kent's uncoilers are for filling into high speed accumulators for the tube mill industry and can handle speed up to 1,800 feet per minute. The uncoiler I have quoted can also be used for accumulators and with the proper brake can handle 1,000 feet per minute. However, by buying direct from Sim-Vision you can save money. We have an excellent exchange rate for US currency and, therefore, we can offer an excellent product at a very competitive price. Please see the quotation.

Kent Corporation has supplied coil end welders to me in the past for entry lines I have built at previous companies. Kent offers the best coil end welding products available. We have had little to no service required in the years I have purchased their products.

I hope we can all work together on this project and many others in the future. I am sure you will be more than happy with our equipment.

Note: We can also quote the straightener and incorporate the Kent coil end welder into our entry at no additional cost. Please call if interested.

Yours very truly,

Kevin Simpson
President

SIM-VISION

Tel: (416) 264-5790
Fax:(416)264-5632

3233 Eglinton Avenue East.Suite 1109 Toronto, Ontario M1J 3N6

QUOTATION NO. 126-98

April 17, 1998

Mr. Darrell Meyer
TRUSSTEEL
3822 East La Palma Ave.
Anaheim, CA. 92807
Fax: (714) 630-0880
Phone: (714) 630-9620

SUBJECT: 10,000 lb. HYDRAULIC DOUBLE UNCOILER

Dear Darrell,
We are pleased to offer the following

ITEM #1 10,000 LBS HYDRAULIC DOUBLE UNCOILER

MODEL # 10K-D-HYD
AS PER SPECIFICATION SHEET #11050

PRICE $ 38,950.00

OPTIONAL

SHOCK ABSORBERS

PRICE $ 2,600.00

NOT INCLUDING :

SHIPPING, INSTALLATION
MACHINE AND ELECTRICAL GUARDING
SET-UP AND ELECTRICAL INTERGRATION

Prices are quoted in US $ dollars

The attached Condition of Sale Bulletin #5000 form is a part of our proposal

F.O.B.:
SIM-VISION, Toronto, Ontario

Terms and Condition
25% Downpayment with P.O.
25% After engineering approval
25% Upon 50% completion
15% Before shipping
10% Net 30 days

Delivery
Based on today's workload is approx. 14-16 weeks.

This quotation is valid for 60 days
Looking forward to hearing from you.

Yours very truly,

Kevin Simpson
President

SIM-VISION

Tel: (416) 264-5790
Fax:(416)264-5632

3233 Eglinton Avenue East, Suite 1109 Toronto, Ontario M1J 3N6

UNCOILER

SPECIFICATION SHEET # 11050
6000 LB. DOUBLE

Model	-	10K-D-HYD
Number of Mandrels	-	2
Capacity	-	10,000LBS/SIDE
Maximum Outside Diameter	-	60”
Maximum Width	-	24”
Inside Diameter Expansion	-	17 ½” - 20 ½”
Expansion Type	-	WEDGE
Expansion Power	-	MANUAL
Number of Drum Segments	-	4
Rotation	-	MANUAL
Rotation Locking	-	HYD WEDGE TYPE
Hand of Operation	-	T.B.A.
Power Supply (Control)	-	T.B.A.
Loading Method	-	C HOOK / LIFT TRUCK
Colour	-	T.B.A.
Brake	-	AIR DRAG 250 FPM MAX
Feed-Up Drive	-	NOT REQUIRED
Hold-Down Roll	-	NOT REQUIRED

SIM-VISION UNCOILERS

Standard Features

- 3000 lb. uncoilers have a link type mandrel
- 6000 lb. and 10000 lb. uncoilers have a wedge type mandrel
- Maximum air pressure required is 80 p.s.i.
- Pneumatic disc brake with air regulator
- (2) two coil keepers per mandrel
- Manual expansion, with (1) one adjusting wrench
- 60" full diameter backing plate
- (4) four leaf mandrels
- 3" sub-base on all double mandrel uncoilers
- Heavy duty, all steel welded construction
- Timken bearings
- Solid wedge locking on double uncoilers
- Standard colour are sky blue and safety orange
- 3 h.p. hydraulic unit with all hydraulic expansion uncoilers (max. 800 psi)
- Individual electrics (stand alone operating uncoilers)

Options

- 12" powered sideways travel
- 72" full backing plates
- Non-powered pneumatic hold-down (free wheel only)
- Hydraulic hold-down free wheel only (top of uncoiler / floor mounted)
- Hydraulic hold-down with feed-up roll (top of uncoiler / floor mounted)
- Bolt on pads (four required) (16"-20"-24" inside diameters)
- Outboard coil retainer (60"-72" diameter coils) (hydraulic / electric)
- Electric loop control (driven uncoilers only)
- Over-running clutch (driven uncoilers only)
- 180 degree powered rotation (double uncoiler only)
- Shock absorber (two required) (double uncoiler only)
- High speed package (300-1000 ft/min), oversized air brake, shock absorbers and dual air pressure brake control
- Special colour paint

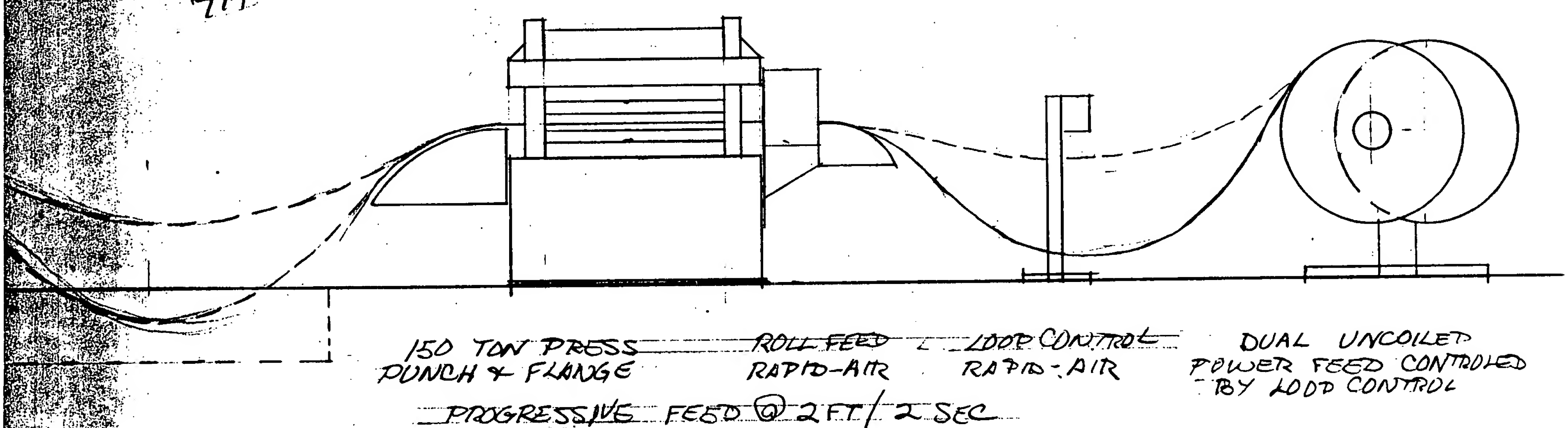
Driven Uncoiler Options

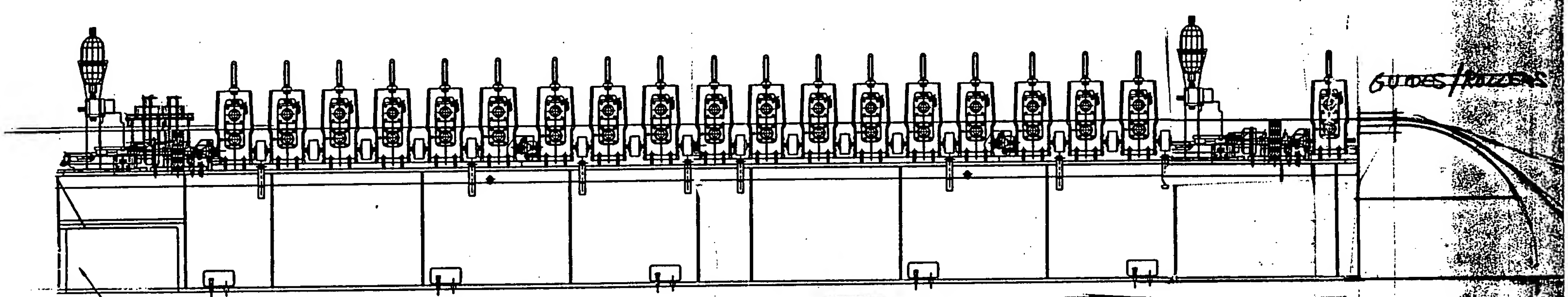
- Hydraulic feed-up (3-5 fpm)
- Electric feed-up (3-5 fpm)
- Hydraulic full time drive (0-100 fpm)
- A.C.-V.F. full time drive (0-100 fpm)
- D.C. full time drive (0-100 fpm)
- Jog forward and jog reverse controls
- Electrical control pendent

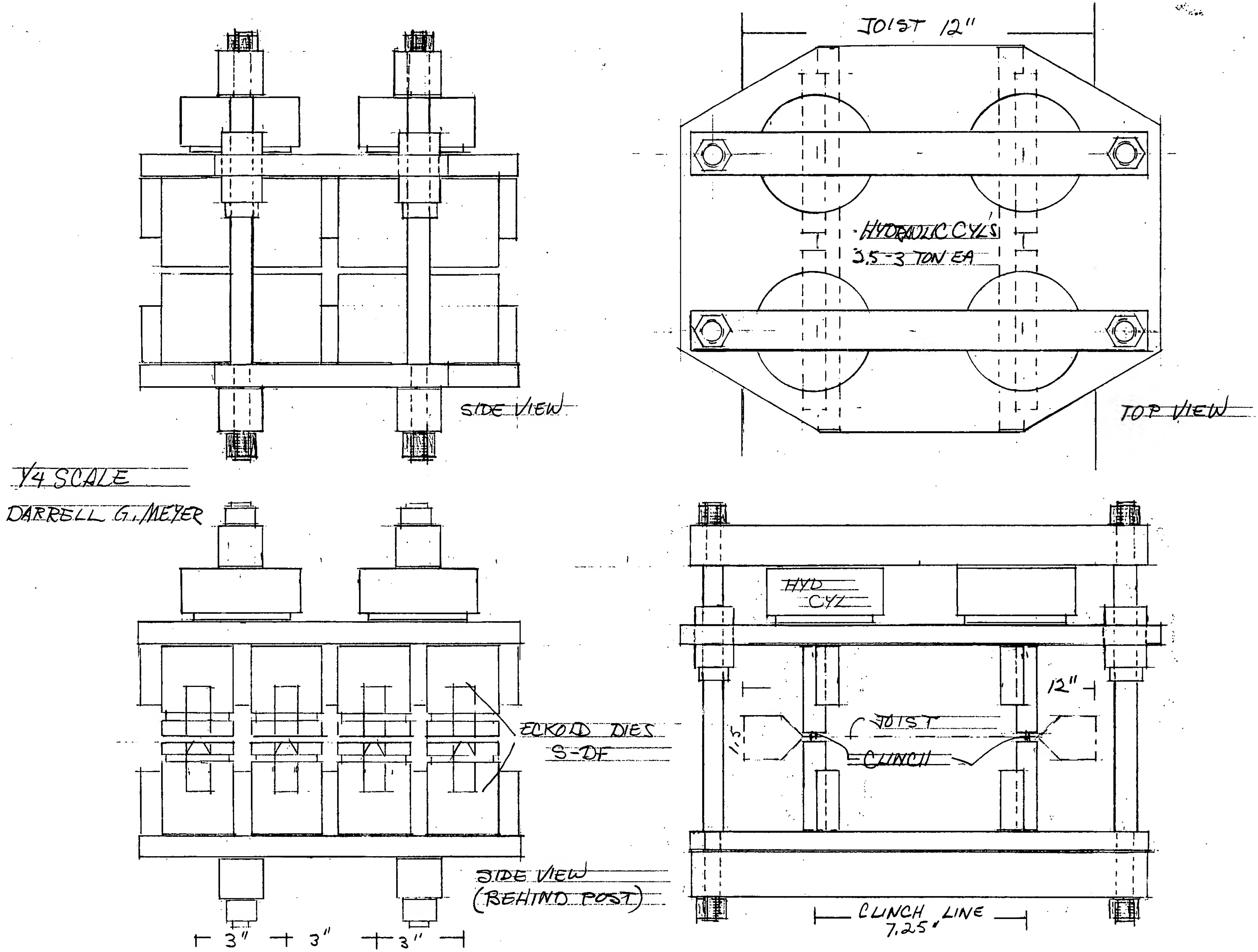
exhibit 36

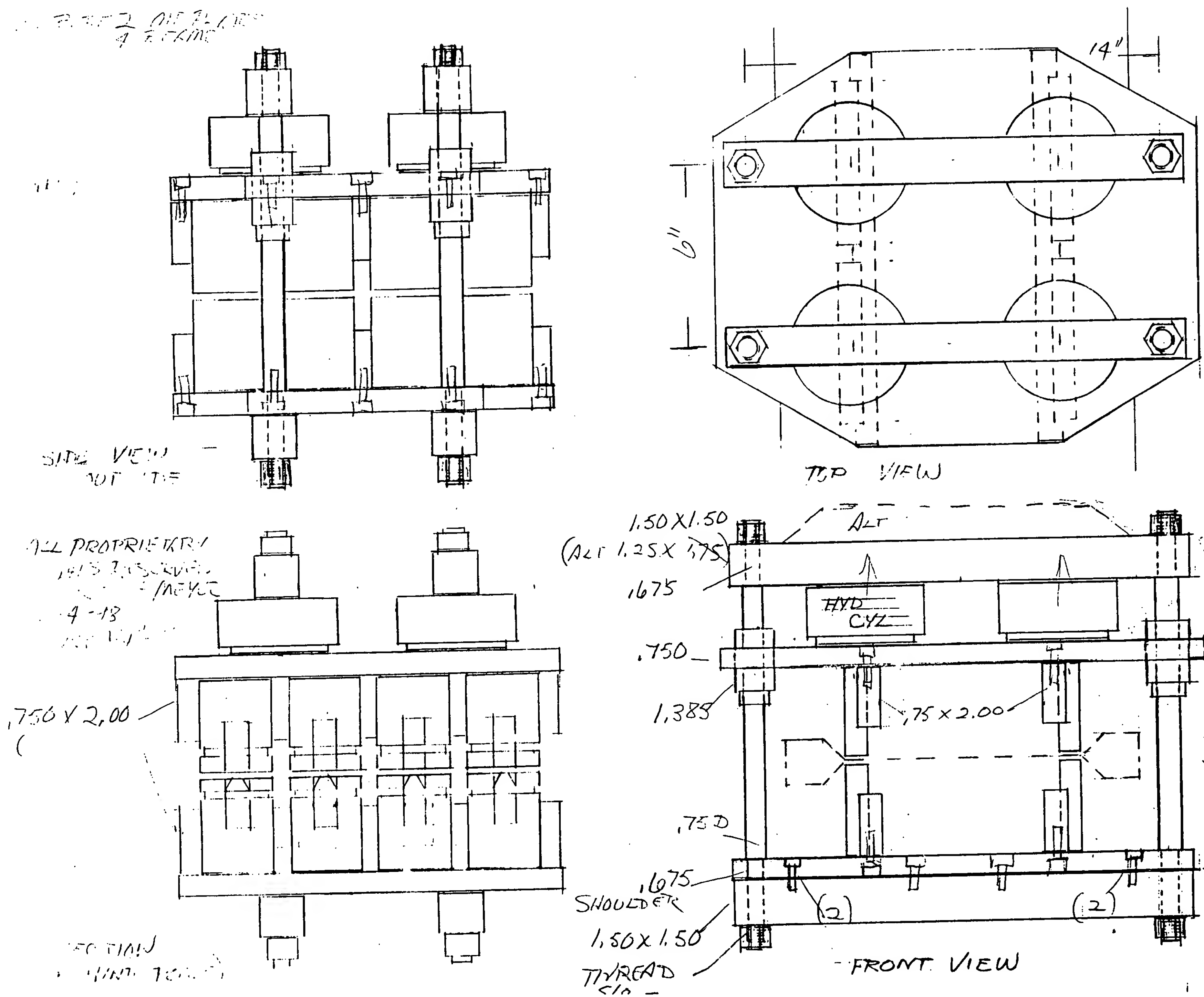
Post-it® Fax Note

		Date 6-4	# of pages
To DAN			
Fax# 503 588-4029			
From DARRELL			
Phone# 714 441-0447			




GUIDES/ROLLERS
FLYING MECH FASTENER
1 FT / 1 SEC
ROLL FORMER
18 STANDS @ 18"o/c
FLYING CUT-OFF
FEED/START
SPEED: 1 FT / SEC 60 FT MIN


SIDE VIEW
JOIST 12"
HYDRAULIC CYLS
3.5 - 3 TON EA
TOP VIEW
1/4 SCALE
DARRELL G. MEYER
HYD
CYL
12"
JOIST
1.5
CLINCH
ECKOLD DIES
S-DF
SIDE VIEW
(BEHIND POST)
3"
3"
3"
CLINCH LINE
7.25"



14"
6"
TOP VIEW
SIDE VIEW
1.50 X 1.50
(ALT 1.25 X 1.75)
ALT
.675
HYD CYL
.750
1.385
.75 X 2.00
.75 D
.675
SHOULDER
1.50 X 1.50
THREAD
FRONT VIEW
.750 X 2.00
4-13

exhibit 37

QUOTATION

National Machinery Exchange, Inc.

Wire and Metal Working Machinery
WEST COAST DIVISION
7805 Paramount Blvd., Pico Rivera, CA 90660 (USA)

Tel: (562) 949-2446
Toll Free: 800-282-6285
FAX: (562) 942-0624
E-mail: nmachine@aimcomm.com

Darrell Meyer
STEEL WORKS
3822 East La Palma
Anaheim CA 92807

Date: 07/13/98
Ref#: 47236

Mach: 103754

Tel : 714-441-0447
FAX : 714-441-0947

We are pleased to offer the following for your consideration:

ONE (1) USED

18 STAND, YODER #M2-1/2 ROLL FORMER

SPECIFICATIONS:-

Previously used for construction panels

Hand of Operation: Left to Right
Shaft Diameter: 3.250"
Keyway: 3/4" W x 9/16" Thick
Roll Space: 38"

Vertical Centers, (Manual Individual Micrometer Adjustment):
5-3/4" to 9"

Horizontal Centers: 18"
Base to Center Line of Bottom Shaft: 8-1/2"
Pass-Line: 38" - Approximate
Equal Geared

EQUIPPED WITH:-

Push-Button Console and Controls
(1) Box of Miscellaneous Tooling (List Available Upon Request)
Currently Tooled for Construction Paneling

"If It's Machinery, We Have It!"

National Machinery Exchange, Inc.

QUOTATION

National Machinery Exchange, Inc.
Wire and Metal Working Machinery
WEST COAST DIVISION
7805 Paramount Blvd., Pico Rivera, CA 90660 (USA)

Tel: (562) 949-2446
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E-mail: nmachine@aimcomm.com

Darrell Meyer
STEEL WORKS
3822 East La Palma
Anaheim CA 92807

Date: 07/13/98
Ref#: 47236

Mach: 103754

Tel : 714-441-0447
FAX : 714-441-0947

MOTOR DATA:-

40 HP, G.E., 550, 1775 RPM
1 HP Boston, 575/1725 RPM

OVERALL DIMENSIONS:- 8'W x 33'6"L x 6'6"H
WEIGHT:- 38,550# Approximate

CONDITION:- Excellent

*** PHOTOS AVAILABLE ***

PRICE: $89,500.00

"If It's Machinery, We Have It!"

National Machinery Exchange, Inc.

Bob Goodspeed / JG

QUOTATION

National Machinery Exchange, Inc.
Wire and Metal Working Machinery
WEST COAST DIVISION
7805 Paramount Blvd., Pico Rivera, CA 90660 (USA)

Tel: (562) 949-2446
Toll Free: 800-282-6285
FAX: (562) 942-0624
E-mail: nmachine@aimcomm.com

Darrell Meyer
STEEL WORKS
3822 East La Palma
Anaheim CA 92807

Date: 07/13/98
Ref#: 47234

Mach: 102129

Tel : 714-441-0447
FAX : 714-441-0947

We are pleased to offer the following for your consideration:

ONE (1) USED

YODER 11 STAND ROLL FORMER

11 Stands on a 12 Stand Base
Unequal Gearing: Gear Driven
Outboard Type - Right to Left Feed

Shaft Diameter .... 3"
Spindle Key Size .... 3/4"
Roll Space .... 30"
Roll Diameter .... 10" Maximum
Vertical Centers .... 5" to 10"
Horizontal Centers .... 18"
Center of Lower Roll to Base .... 8.5"
Height of Base .... 24"
Speed (Approx.)............................ 75 FPM

Coolant Pump & Motor 230/460/3/60
Main Motor .... 50 HP 870 RPM 550/3/60

Equipped with:

Powered Entry Rolls
Powered Exit Rolls
Entry Guide & Exit Guide
Micrometer Screw - Vertical Adjustment
In-Base Coolant Reservoir
Individual Coolant Nozzles
Gusher 1/2 HP 3450 RPM

Weight (approx.) 20,000 Lbs.
Overall Dim. <est> 285" l-r x 77" f-b x 57

PRICE: $54,500.00

National Machinery Exchange, Inc.

Bob Goodspeed / jg

QUOTATION

National Machinery Exchange, Inc.
Wire and Metal Working Machinery
WEST COAST DIVISION
7805 Paramount Blvd., Pico Rivera, CA 90660 (USA)

Tel: (562) 949-2446
Toll Free: 800-282-6285
FAX: (562) 942-0624
E-mail: nmachine@aimcomm.com

800 631-4470
BOB DWYER

Darrell Meyer
STEEL WORKS
3822 East La Palma
Anaheim CA 92807

Date: 07/13/98
Ref#: 47235

Mach: 101816

Tel : 714-441-0447
FAX : 714-441-0947

We are pleased to offer the following for your consideration:

ONE (1) USED

YODER 15 STAND ROLL FORMER

ARBOR DIAMETER .... 2-1/2"
MAXIMUM WIDTH BETWEEN HOUSINGS .... 27-1/2"
HORIZONTAL DISTANCE BETWEEN CENTERS .... 20-1/2"
MAXIMUM VERTICAL DISTANCE BETWEEN CENTERS ...... 10.8"
MINIMUM VERTICAL DISTANCE BETWEEN CENTERS ...... 6"

EQUIPPED WITH: ADJUSTABLE ENTRY EDGE GUIDE SIDE PLATES MOUNTED ON IDLER ROLL STAND
EDGE GUIDE ROLL STAND ADJUSTED VIA HAND CRANK SCREW
OUTBOARD HOUSING BASES BOLTED TO T-SLOTS IN MACHINE BED TO HOLD THEM INTO POSITION
DIRECTION OF FLOW: LEFT TO RIGHT
40 KW 3/230-380/50 (1450 RPM) 133/77 AMP MOTOR ELECTRIC BRAKE

PRICE: $59,500.00

SHAFT DR

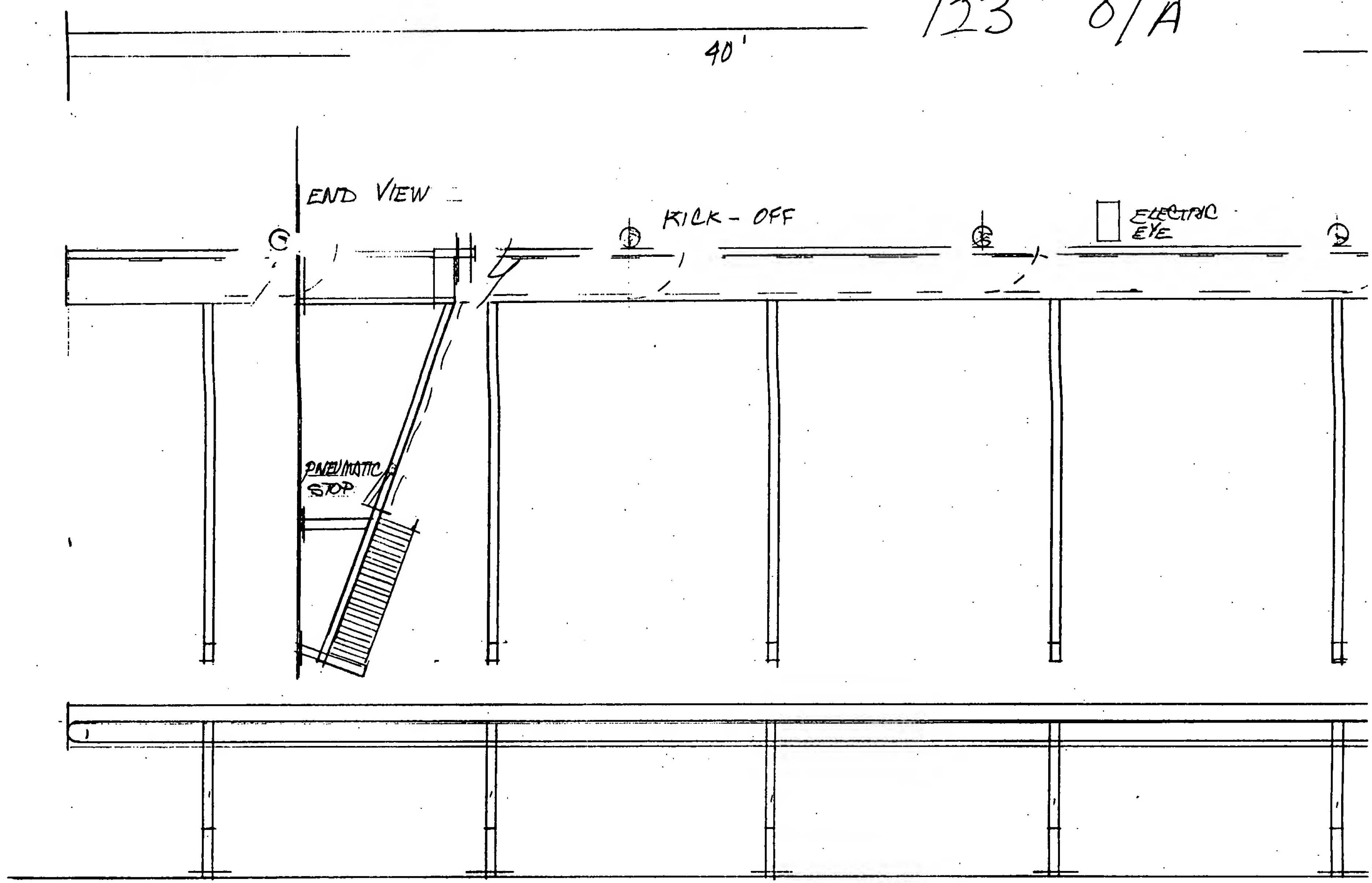
"If It's Machinery, We Have It!"

National Machinery Exchange, Inc.

Bob Goodspeed / jy

Exhibit 38

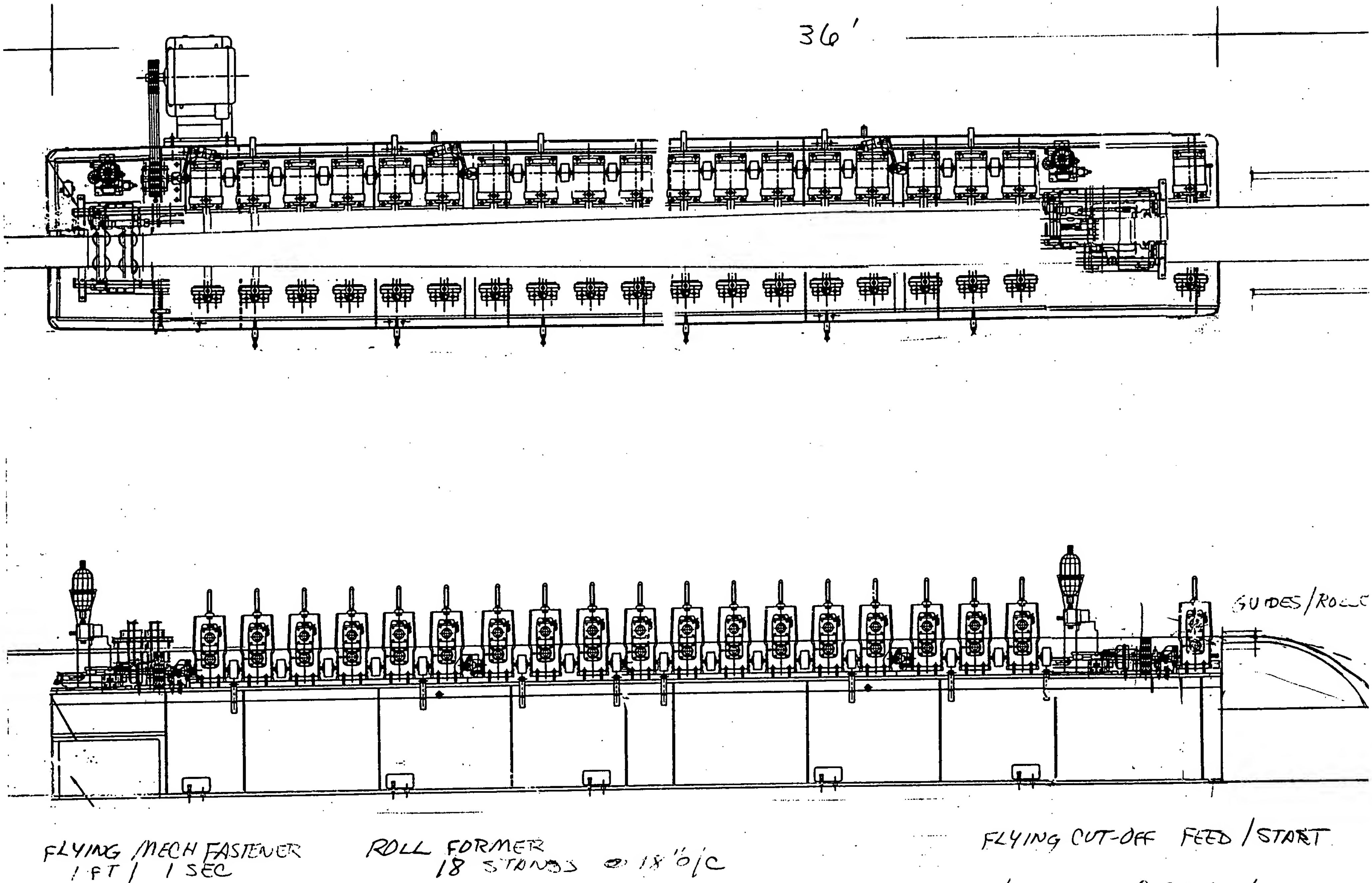
123' O/A

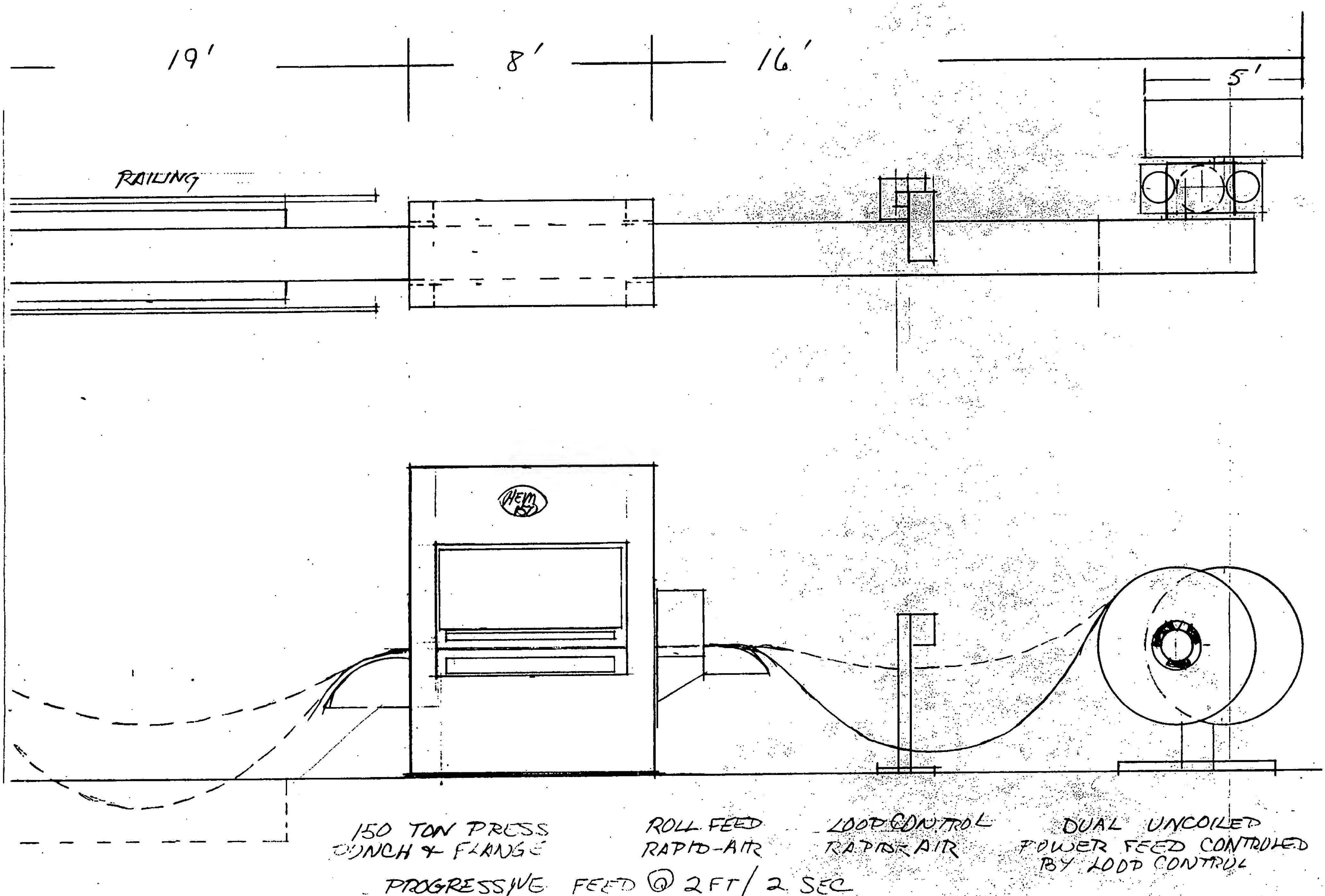


LIVE ROLLER CONVEYOR
HYTROL 138 SP

ALT CONVEYOR BELT
HYTROL TA

INCLINE STACKER - GRAVITY
5-PNEUMATIC STOPS


36'
GUIDES/ROLLS
FLYING /MECH FASTENER
1 FT / 1 SEC
ROLL FORMER
18 STANDS @ 18" O/C
FLYING CUT-OFF
FEED / START
SPEED: 1 FT / SEC 60 FT MIN



DARRELL G. MEYER 7-20-98
714 441-0447 ANAHEIM, CA

exhibit 39

Sterling
MACHINERY EXCHANGE
THE LATEST IN QUALITY USED FABRICATING & CHIP MAKING MACHINERY • ALL MAJOR BRANDS BUY • SELL • TRADE

CRAFTSMAN DOOR 7/29/98
ATTN: DARRELL MEYER

We are pleased to offer the following for your consideration:

ONE (1) USED
17 Stand ARDCOR Model S10-2-1/2-33 Roll Former

SERIAL NUMBER: 90-052
AGE: 1990

SPECIFICATIONS:
17 Stand on 18 Stand Base
Hand of Line: Right to Left
Capacity: .048" or 18 Ga.
Line Speed: 60 FPM (Via Pulley Drives)
Spindle Diameter: 2-1/2"
Roll Space: 33"
Horizontal Distance: 10"
Vertical Adjustment: 4" - 5-1/4"
Base to Centerline of Lower Spindle: 5-3/4"
Passline: 40"
Spindle Gear Ratio: 1:1 (Equal Geared)
Drive Reduction Ratio: 12:1
Key Way Size: 3/8" x 3/16"

EQUIPPED WITH: Individual Gear Box Drives SMET
Air Clutch
Micrometer Adjustment on Rolls
(3) Side Pass Guides
Push Button Controls
Electrical Control Panel
Coolant Pump

Motor Data: 40 HP, 220/440/3/60 - 1200 RPM
Overall Size: 17'6" L x 6' W x 52" High
Weight: 18,000 Lbs. Total
Condition: VERY GOOD

Loaded on Truck..................Toledo, (Campbell St. Whse.) OH
**PHOTO & CATALOGUE CUTS AVAILABLE

PRICE: $84,500.00

THANK-YOU
RICK KRUGER

Sterling

MACHINERY EXCHANGE

THE LATEST IN QUALITY USED FABRICATING & CHIP MAKING MACHINERY • ALL MAJOR BRANDS BUY • SELL • TRADE

CRAFTSMAN DOOR

ATTN: DARRELL MEYER

7/29/98

OFFER TO SELL

We offer the following subject to the supplemental terms and conditions

17 Stand Yoder Roll Former

Serial No.: 7103-677
Year: 1977

Unequal Geared
36" Roll Space - T-SLOTTED
4" - 8" Vertical Adjustment
15" Horizontal Center Dist.
2 1/2" Spindle Diameter
Speed: 300 FPM
40 HP Drive, 220/440V, 1740 RPM
Air clutch/Brake
Coolant System
10 Spare Shafts

Base dimension: 31" High x 64" Wide x 23' Long

PRICE: .... U.S. $ 99,500.00

THANK-you

RICK KRUGER

Sterling

MACHINERY EXCHANGE

THE LATEST IN QUALITY USED FABRICATING & CHIP MAKING MACHINERY • ALL MAJOR BRANDS BUY • SELL • TRADE

CRAFTSMAN DOOR 7/29/98

ATTN: DARRELL MEYER

Gentlemen: We are pleased to offer, subject to prior sale and conditions on back:

** ONE(1) PRE OWNED PEARSON MODEL 16-2.5-40 ROLL FORMING LINE **

Serial Number:	R223
Date of Manufacture:	1967
NUMBER OF STANDS:	18
ARBOR (SHAFT) DIAMETER:	2 1/2"
ROLL SPACE:	30"
HORIZONTAL SPACE - C TO C BETWEEN STANDS:	14"
VERTICAL CENTERS:	5" - 7"
SPEED:	25/36/47/57/67/82/86/123 FPM

Equipped with:
****

EQUAL GEARING
REMOTE OPERATOR CONTROLS PENDANT
BASE DRILL AND TAPPED FOR ROLL SPACE ADJUSTMENT ON 8" INCREMENTS
EGAN 20,000# MOTORIZED UNCOILER - HYDRAULIC EXPANSION - 72" OD X 40"
YODER P60 CUT OFF PRESS - 3" STROKE - 32" X 16" BED AREA - AIR CLUTCH
NOTE: MACHINE IN PLANT UNDER POWER UNTIL 31 MAY 1998

MOTOR:	40 HP., 3/60/220-440
Dimensions of Machine:	48'(LR) X 60"(FB) X 72"(H)
Weight:	16000#

Price - FOB Open Top Truck - , PLANT LOCATION $112,500.00

OK ON LINE ONLY

THANK-YOU

RICK KRUGER

Sterling Machinery Exchange
WEB:WWW.sterlingmachineryexch.com
9310 GARVEY AVE
SOUTH EL MONTE, CA 91733

Phone:(626) 444-0311, Fax: (626) 443-9588

BILL

RICK

Machine No: 5915

STERLING MACHINERY EXCHANGE IS PLEASED TO OFFER FOR YOUR CONSIDERATION:

ONE Preowned HEIM STRAIGHT SIDE PRESS
MODEL S150, SERIAL NO 1740 1976

CAPACITY: 150 TON X 4 IN
STROKE .... 4"
BED AREA (L-R, F-B) .... 78" X 42"
SHUT HEIGHT .... 12"
RAM ADJUSTMENT .... 6"
STROKES PER MINUTE 45
WINDOW SIZE (L-R, T-B)........................ 22 1/2" X 12" 22 1/4
DIMENSIONS (L X W X H) .... 95" X 63" X 138"
WEIGHT .... 17,500 LBS

EQUIPPED WITH:
42" X 60" T-SLOTTED BOLSTER PLATE
AIR CLUTCH & BRAKE
MOTORIZED RAM ADJUSTMENT
DUAL COUNTER BALANCE
SURGE TANK
AUTO LUBE
INCH-SINGLE-CONTINUOUS SETTING
TOP STOP
DUAL PALM STATION
HORSEPOWER: 15

Bill

42,500

~~[illegible]~~

TEMPORARY SPECIFICATIONS SUBJECT TO VERIFICATION
ALL QUOTATIONS SUBJECT TO PRIOR SALE

STERLING MACHINERY EXCHANGE

BY: ______________________
Page _____ of _____

#3 , 57,500

Sterling Machinery Exchange
WEB:WWW.sterlingmachineryexch.com
9310 GARVEY AVE
SOUTH EL MONTE, CA 91733

Phone:(626) 444-0311, Fax: (626) 443-9588

Machine No: 5837

STERLING MACHINERY EXCHANGE IS PLEASED TO OFFER FOR YOUR CONSIDERATION:

ONE Preowned DURANT DOUBLE SIDED COIL REEL
MODEL HLDD-20, SERIAL NO 59511182

CAPACITY: 4000 LB X 20 IN

MAX WEIGHT EACH SIDE .... 4000 LBS
MAX WIDTH .... 20"
INTERNAL DIAMETER RANGE .... 16 1/2" - 20"
MAX OUTSIDE DIAMETER .... 48"
SPINDLE SPEEDS (VARIABLE) .... 0 - 57 RPM
DIMENSIONS (L X W X H) .... 67" X 100" X 76"
WEIGHT (APPROX.) .... 2000 LBS
.
EQUIPPED WITH:
(12) KEEPERS
D.C. VARIABLE DRIVE
MANUAL ADJUSTMENT
VDC SPEED REFERNCE SIGNAL
JOG, FORWARD, REVERES SWITCH
*NOTE: THIS MACHINE WAS NEVER USED JUST OUT OF CRATE, NEW
HORSEPOWER: 2

$14,500.00

TEMPORARY SPECIFICATIONS SUBJECT TO VERIFICATION
ALL QUOTATIONS SUBJECT TO PRIOR SALE

STERLING MACHINERY EXCHANGE

BY:____________________
Page _____ of _____

Web Site: http://www.sterlingmachineryexch.com

RICK L. KRUGER
General Manager

Sterling

MACHINERY EXCHANGE

TEL 323-283-4111
TEL 626-444-0311
FAX 626-443-9588

THE LATEST IN QUALITY USED
FABRICATING & CHIP MAKING MACHINERY
ALL MAJOR BRANDS BUY • SELL • TRADE

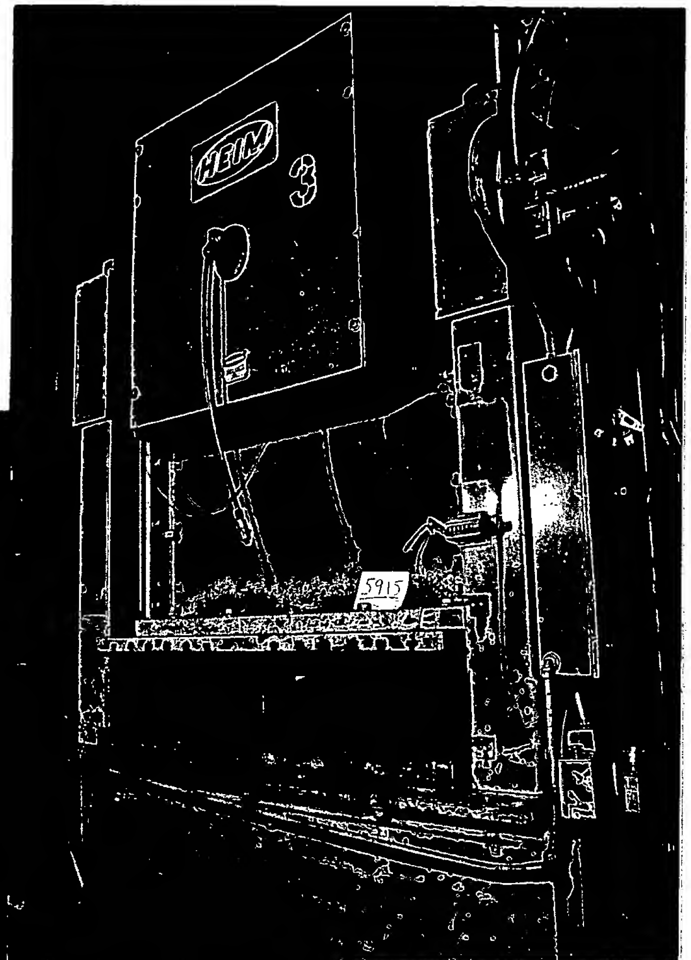
9310 GARVEY AVENUE, SOUTH EL MONTE, CALIFORNIA 91733

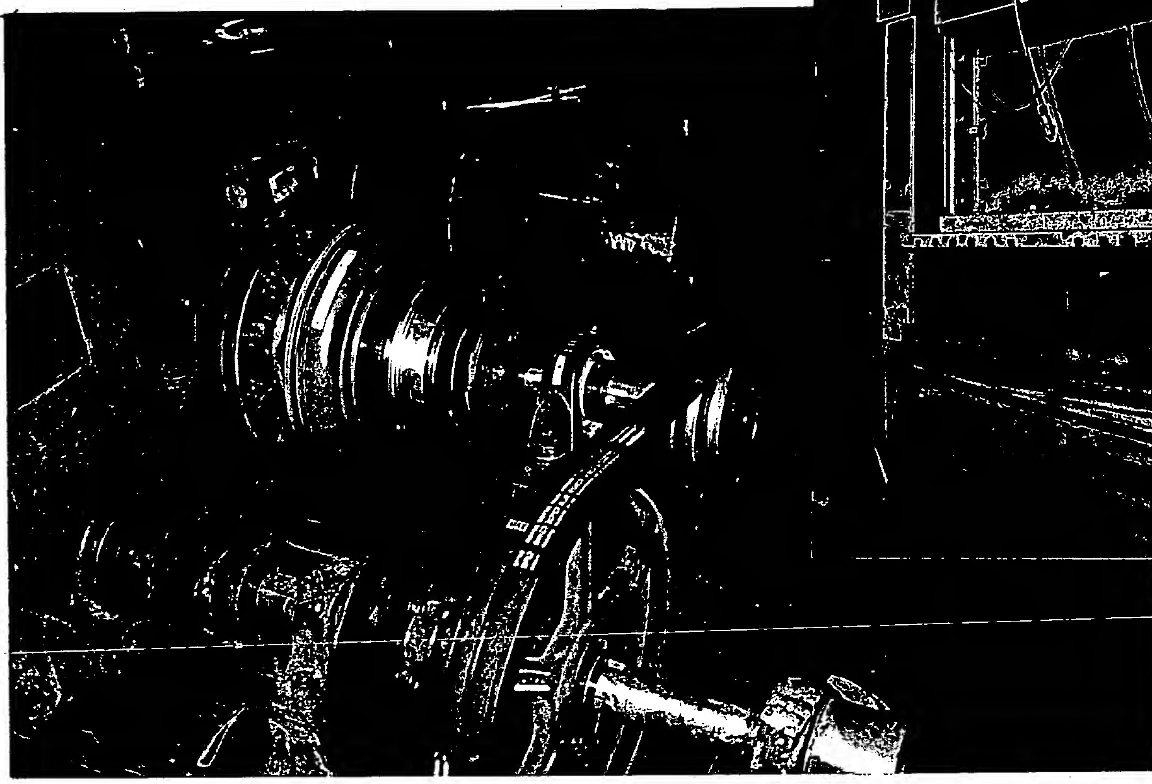
KECK & SCHMIDT ★
RICK

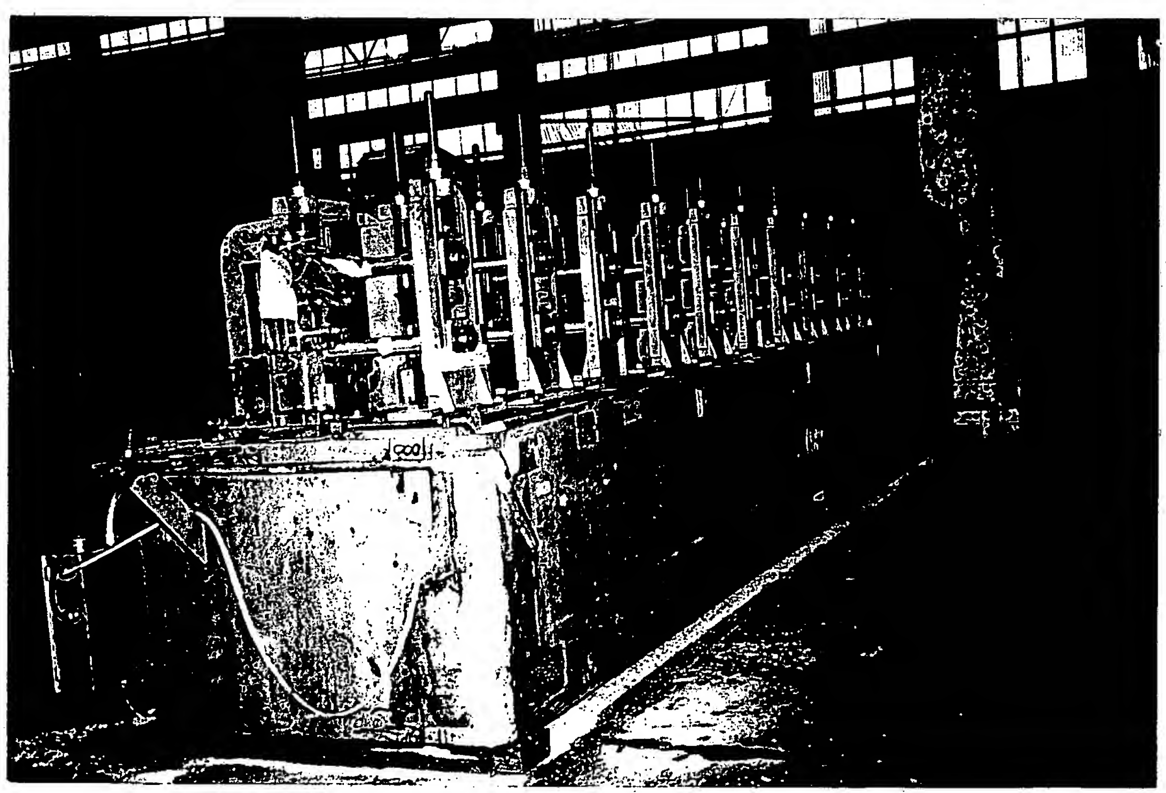
PETE KECK

626 579-3890

DESIGNER







STERLING
7-98

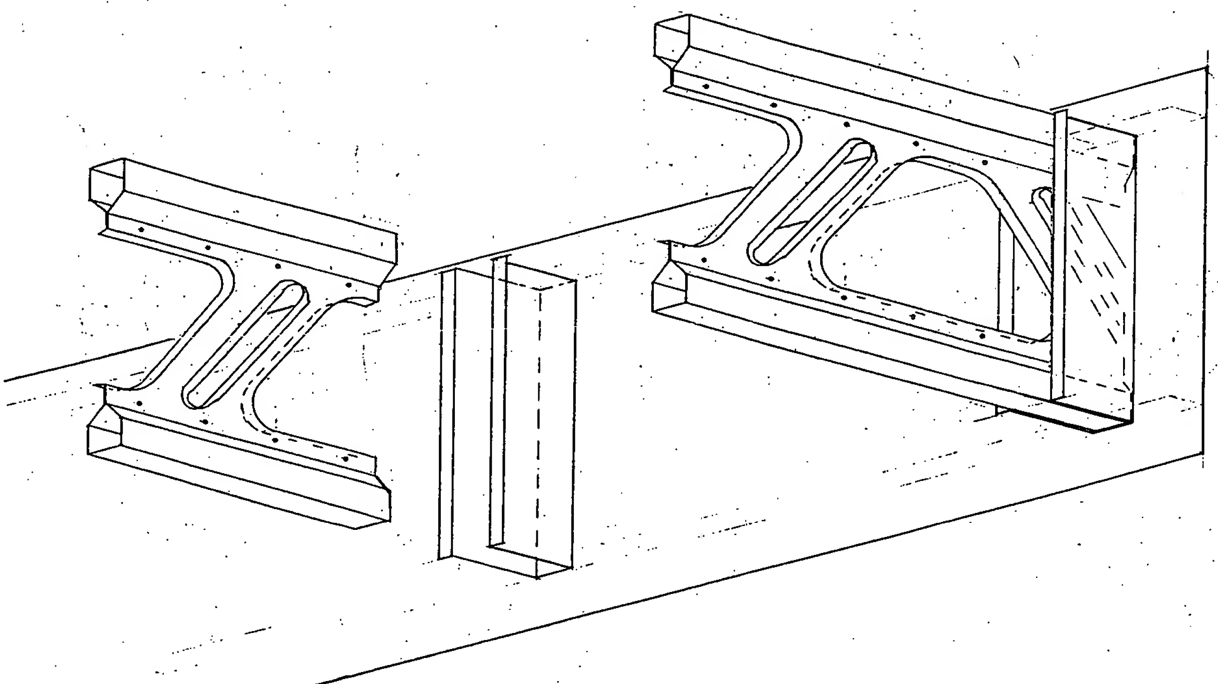


exhibit 40

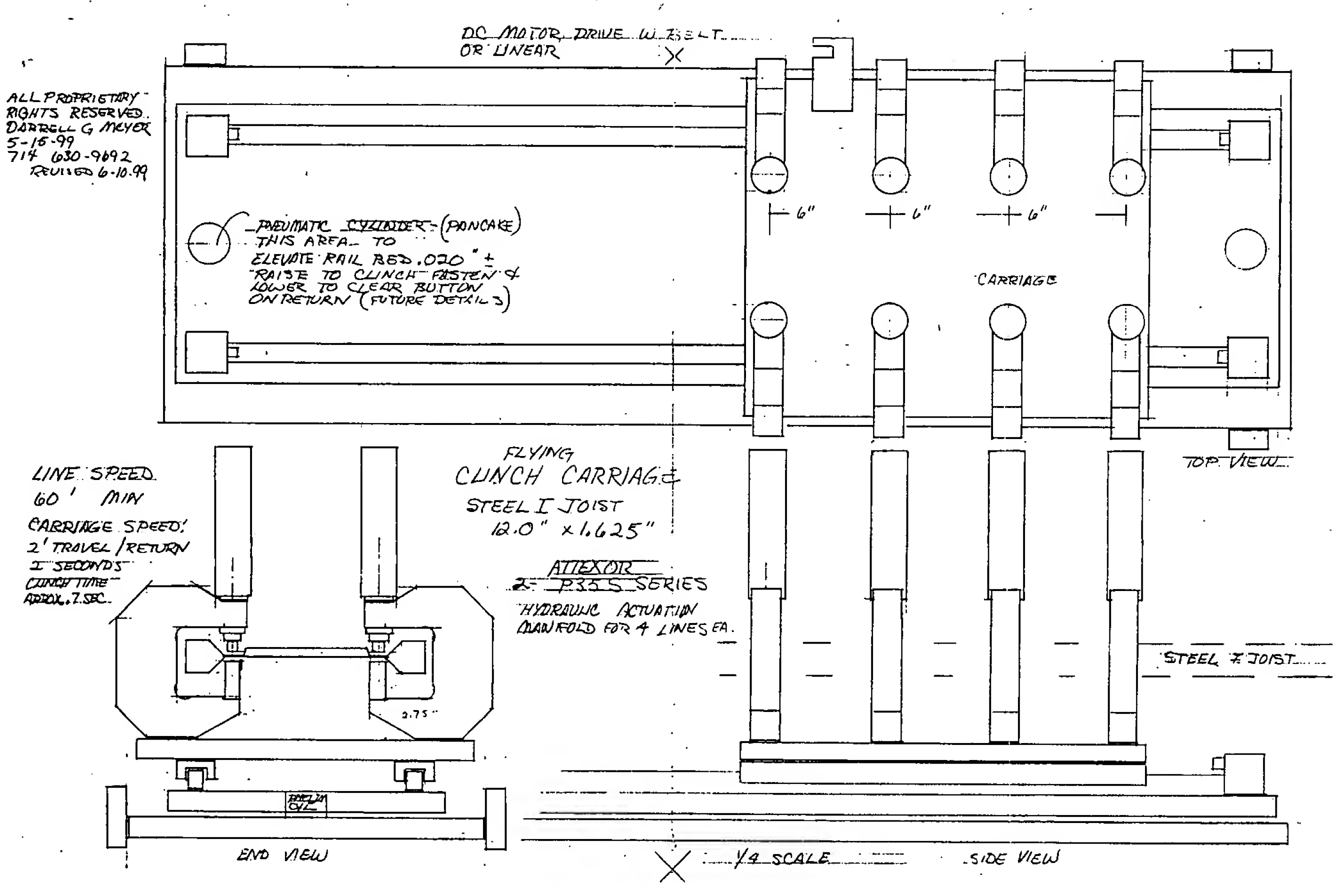

ALL PROPRIETARY RIGHTS RESERVED.
DARRELL G MEYER
5-15-99
714 630-9692
REVISED 6-10-99
DC MOTOR DRIVE W/ BELT
OR LINEAR
PNEUMATIC CYLINDER (PANCAKE)
THIS AREA TO
ELEVATE RAIL BED .020" ±
RAISE TO CLINCH FASTEN &
LOWER TO CLEAR BUTTON
ON RETURN (FUTURE DETAILS)
6"
6"
6"
CARRIAGE
TOP VIEW
LINE SPEED
60' MIN
CARRIAGE SPEED:
2' TRAVEL/RETURN
1 SECONDS
CLINCH TIME
APPROX. .7 SEC.
FLYING
CLINCH CARRIAGE
STEEL I JOIST
12.0" x 1.625"
ATTEXOR
2- P33 S SERIES
HYDRAULIC ACTUATION
MANIFOLD FOR 4 LINES EA.
STEEL I JOIST
2.75"
END VIEW
1/4 SCALE
SIDE VIEW

exhibit ~~Z~~41

STRUCTURAL EVALUATION OF STEELWORKS' SteelJoist™

Prepared for

USS/POSCO
900 Loveridge Road
Pittsburg, CA 94565

and

SteelWorks
3822 E. La Palma Avenue
Anaheim, CA 92807

by

NAHB Research Center, Inc.
400 Prince George's Boulevard
Upper Marlboro, MD 20774-8731

June 1999

NAHB RESEARCH CENTER

America's Housing Technology and Information Resource

STRUCTURAL EVALUATION OF STEELWORKS' SteelIJoist™

Prepared for

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Pittsburg, CA 94565

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SteelWorks
3822 E. La Palma Avenue
Anaheim, CA 92807

by

NAHB Research Center, Inc.
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Upper Marlboro, MD 20774-8731

June 1999

Acknowledgements

This report was prepared by the NAHB Research Center for USS/POSCO. The Research Center expresses great appreciation to the sponsor of this work, USS/POSCO, in view of its relevance to more affordable design and construction of residential and light commercial floor systems using cold-formed steel framing. Special appreciation is extended to Ken Vought of USS/POSCO and Darrell Meyer of SteelWorks for their assistance throughout the project.

The principal author and investigator of this report is Nader R. Elhajj, P.E. Technical review was provided by Jay Crandell, P.E. Lab support was provided by Christian Jacobs and administrative support was provided Lynda Marchman.

Table of Contents

1.0 Introduction

Over the past several years, the materials used to construct the frame of a home have been subject to various forces that have contributed to upward pressures on home prices. Unpredictable fluctuations in the price of framing lumber, as well as concerns with its quality, have caused builders and contractors to seek alternative building products.

Cold-formed steel (CFS) joists have been used where large spans are called for and where engineered wood joists are too costly to use. However, one of the major barriers to the use of CFS floor joists is the impact it has on placement of large waste drains and ductwork installed in the floor system. Current requirements limit maximum hole (opening) sizes in CFS joists to about 2.5-inches (6.35 cm) in diameter. This limitation can accommodate short plumbing runs and electrical wiring, but restricts the use of larger and longer septic drains and ductwork.

The SteelIJoist™ provides the builder with a truss shaped joist with lengths up to 40 feet that can easily accommodate plumbing and waste lines as well as HVAC installation. The SteelIJoist™ is fabricated by a continuous roll forming process with punched openings, formed flanges, and mechanically fastened chord sections. The top and bottom chord sections of a SteelIJoist™ have pentagonal shapes that provide flat sides for attachment to end caps, hangers and brackets. Each SteelIJoist™ has trapezoidal shaped folded web openings at 24 inches on center, along the entire length of the joist that can accommodate up to 6-inch diameter passage for utilities. A web foldout further stiffens the web between the trapezoidal openings. The joist system comes with a predesigned and precut end cap that fits on either end of the joist. The end cap is used to attach the SteelIJoist™ to the rim track. The SteelIJoist™ comes in one size that is 12'-inches deep with two thicknesses, 18 and 20 gauge, as shown in Figure 1.

Some of the practical benefits of this innovation in the design of CFS floor joists are as follows:

- job site flexibility (i.e. constructability);
- allowance for larger HVAC ducts, plumbing, and electrical systems in the floor cavity;
- elimination of shrinkage problems occasionally experienced with wood frame floors;
- capability of long spans;
- light weight (approximately 2.8 lb/ft);
- may be cut at any dimension using end caps;
- factory end caps (two types) that are easy to attach; and
- factory rim tracks (bands) with end caps attached available.

The objective of this test program is to determine the structural performance of 18 gauge and 20 gauge, 12-inches deep SteelIJoist™. Joist serviceability issues (such as vibration and noise) are not addressed in this report.

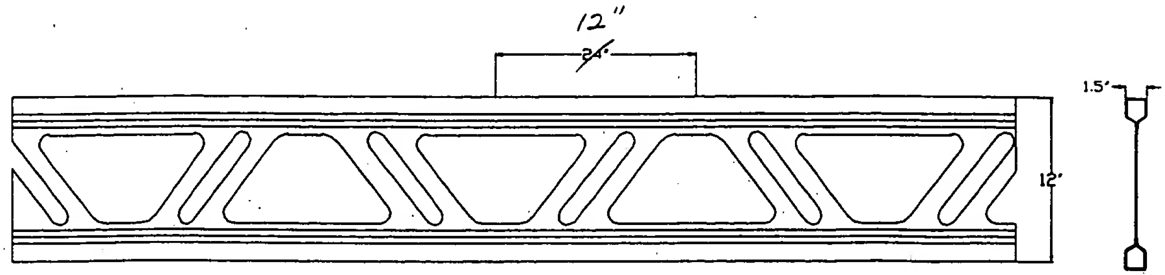

Figure 1 - SteelIJoist™ Detail

2.0 Experimental Approach

Test Plan and Specimens

A total of 39 SteelIJoist™ joist assemblies and components were tested in a variety of configurations as shown in Table 1. All steel materials had a minimum specified tensile strength of 50 ksi that was verified by tensile tests in accordance with ASTM A370 [1]. Tensile tests were performed on a sample of three joists for each joist thickness. Base steel thicknesses were measured in accordance with ASTM A90 [2]. Mechanical properties were based on coupons cut longitudinally from the center of the specimen's web.

Table 1
SteelIJoist™ Test Plan

SteelIJoist™ Web Depth (in)	Thickness (Gauge)	Yield Strength (ksi)	Span Length (ft-in)	Test No.	Planned Loading and/or Failure Mode
12	20	50	2'-0"	1,2	Shear
12	20	50	10'-0"	3,4	Combined Shear & Bending
12	20	50	18'-0"	5,6	Bending
12	18	50	2'-0"	7,8	Shear
12	18	50	10'-0"	9,10	Combined Shear & Bending
12	18	50	18'-0"	11,12	Bending
12	20	50	2'-0"	13,14	Shear with end caps
12	18	50	2'-0"	15,16	Shear with end caps
12	20	50	6'-0"	17	Mid-span loading
12	20	50	6'-0"	18	Mid-span loading w/Drilled clinches
12	20	50	6'-0"	19,20	Mid-span loading w/Cut webs
12	18	50	6'-0"	21	Mid-span loading
12	18	50	6'-0"	22	Mid-span loading w/Drilled clinches
12	18	50	6'-0"	23,24	Mid-span loading w/Cut webs
12	18	50	8'-0"	25	8'-0" Rim Joist - Two point loading
12	18	50	6'-0"	26,27	6'-0" Rim Joist – Two point loading
End Cap	18	50	1'-0"	28,29,30	Compression load – Unstiffened end cap
End Cap	18	50	1'-0"	31,32,33	Compression load – Stiffened end cap
Coupon	20	50	0'-8"	34,35,36	Mechanical properties
Coupon	18	50	0'-8"	37,38,39	Mechanical properties
Total No. of tests				39	

Test Procedure

The specimens were tested in the NAHB Research Center's Universal Testing Machine (UTM) using the test method in ASTM D198-97 [3]. The ASTM standard requires specimens to be mounted in a testing apparatus capable of applying measurable loads at a constant load rate.

The cross-head of the UTM was fitted with an apparatus capable of applying the total load at one point or two points equidistant from the reactions. The locations of the two point loads and end reactions divide the specimen (bending test) into three equal sections. The load was applied by the UTM and transmitted to the load plates by a cross beam. The following information was recorded and reported for each test:

- Span length (see Table 1),
- Load, support mechanics, and any lateral supports used,
- Rate of load application,
- Actual physical and mechanical properties, including thickness, yield strength, ultimate strength (coupon tests), and a statistical measure of variability of these values (see Tables A1, A2, and A3 of Appendix A),
- Description of observed failure mode, and,
- Ultimate loads and deflections and a statistical measure of variability of these values (see Tables A4 and A5 of Appendix A).

When thin steel bending members with web openings are subjected to loads, three failure modes may occur: (a) bending, (b) shear, (c) web crippling. Since end caps are used for each joist, web crippling failure modes has not been investigated in this report. Therefore, joists were tested to induce shear failure, bending failure, and combined shear and bending interaction failure.

Shear Test

The purpose of this test was to investigate the behavior of a SteelJoist™ when subjected to a constant shear force. Two different configurations were used for shear tests. The first set of tests was conducted without end caps installed at the ends of the each specimen. End caps were installed at the end of each specimen for the second set of tests to preclude web-crippling failure. Short span members were used to minimize the influence of bending. Each test specimen utilized a single joist, simply supported, with a 24-inch long span. Rollers and bearing plates were used at each end. The beam was restrained to prevent rotation. In addition, lateral supports braced the central portion of the joist to prevent lateral movements at mid span. A concentrated load was applied near the joist support, as shown in Figure 2. A deflection gage was placed under the joist to measure the vertical deflection of the test specimen at mid-span.

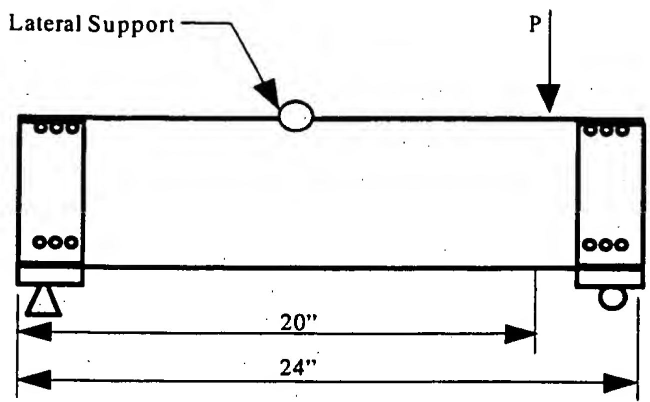

Figure 2 - Shear Test Setup (with end caps)

Bending Test

The purpose of this test was to investigate pure bending capacity of a SteelIJoist™ stabilized against lateral-torsional buckling. To stabilize the specimen against lateral-torsional buckling, each test specimen consisted of two SteelIJoist™ sections inter-connected by 23/32-inch thick oriented-strand-board (OSB) and 5/8- inch thick gypsum board strips. The 6-inch x 16-inch x 1/2-inch OSB strips were spaced at 24-inches on center and fastened to top flanges with #10 self-drilling, tapping screws (two screws per flange). The 5/8-inch gypsum board strips were also spaced at 24-inches on center and fastened to the bottom flanges with #10 self-drilling, tapping screws (two screws per flange). The test set up is shown in Figure 3. End caps were used at the end of the assembly to prevent the joists from moving laterally and rotating. Rollers and bearing plates were used at each end of the assembly. Two concentrated loads were applied at third point locations of each specimen. This loading arrangement provided a pure moment region in the central portion of the beam while the two end sections experienced a linearly increasing bending moment with increasing distance from the ends. A deflection gage was placed under the assembly at mid-span to measure the vertical deflection of the test specimen.

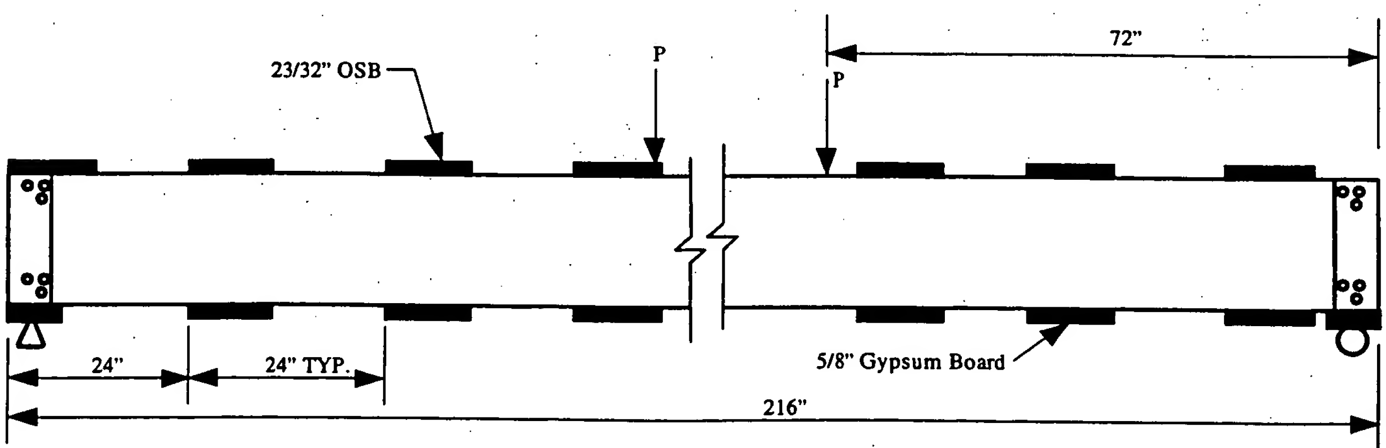

Figure 3 - Bending Tests Setup

Combined Shear and Bending (Interaction) Test

The purpose of this test is to investigate the behavior of a single SteelIJoist™ subjected to a combined shear force and bending moment. Each test specimen was tested as a continuous two-span beam subjected to two point loads. The continuous joist length was 10-feet, with each span 60-inches long. Point loads were applied at a distance of 30-inches from each end. Rollers and bearing plates were used at each end and a bearing plate was used at mid-span. End caps were used at the both ends to prevent the beam from moving laterally or rotating. In addition, lateral supports were attached to the central portion of the beam to prevent lateral-torsional buckling of the test specimens. Deflection gages were placed under each point load to measure the vertical deflection of the test specimen. The combined shear and bending test configuration is shown in Figure 4.

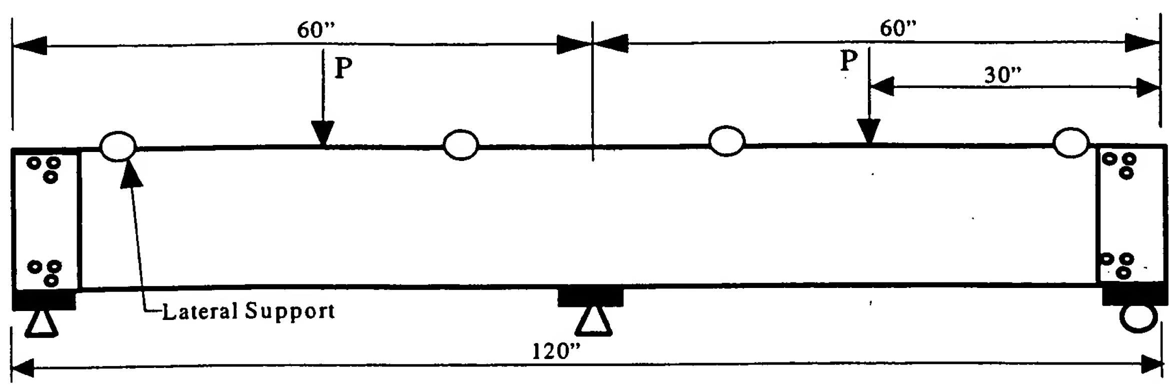

Figure 4 - Combined Bending and Shear Test Setup

Mid-Span Loading with Cut Webs or Drilled Clinches

The top and bottom chords of each SteelIJoist™ are typically clinched at 3-inch on center. A six-foot joist specimen was tested with every other clinch drilled out to investigate the impact of increasing the spacing between clinches. Tests were also conducted to investigate the impact of removing one of the vertical folded webs along the beam except at the ends.

Tests were conducted utilizing single simply supported joists. Rollers and bearing plates were used at each end. End caps were used at the ends to prevent the joist from moving laterally or rotating. In addition, braces were attached to the central portion of the joist. The test configuration is shown in Figure 5.

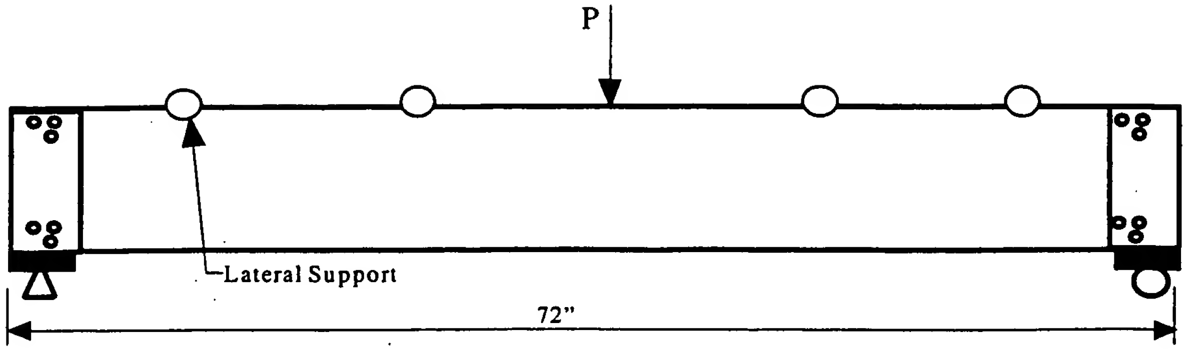

Figure 5 – Mid-span Loading for Drilled Clinches and Cut Webs Test Setup

Rim Joist Test

Two rim joist configurations were tested to determine their capacity in resisting gravity loads. The purpose of these tests is to investigate the potential use of the rim joists as headers.

One 8-foot and two 6-foot simply supported rim joist assemblies were tested. Rollers and bearing plates were used at each end. Partial SteelIJoist™ were fastened to the rim joist at 24-inches on center as shown in Figure 6. The rim joist assembly was stabilized against rotation and lateral buckling by using lateral supports. Point loads were applied at a distance of 1/3 span from each end.

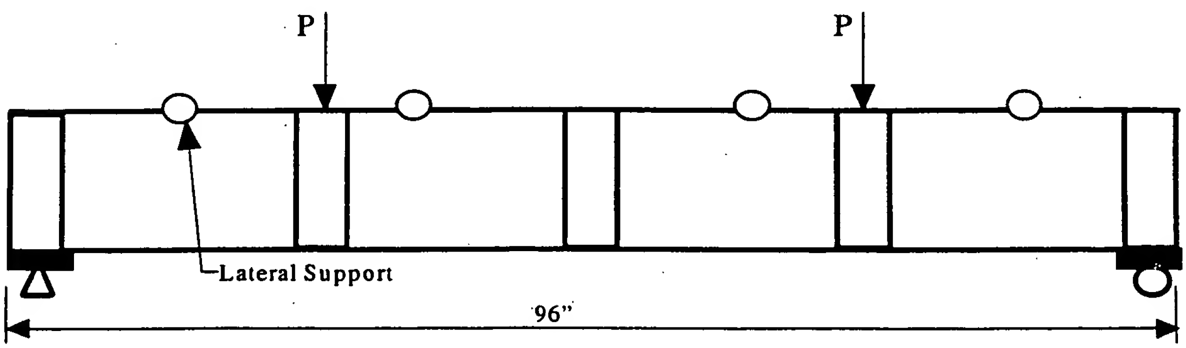

Figure 6 – Rim Joist Test Setup

End Cap Test

All end caps used in the tests were 43 mil (18 gauge) thick. Two end cap configurations were tested to establish their compressive strength. The two configurations are described below:

- Standard end cap consisting of a U-shaped section with return lips bent towards the outside of the U-shape as shown in Figure 7.

- Stiffened end cap with intermediate stiffeners along the flanges of the U-shaped section as shown in Figure 8.

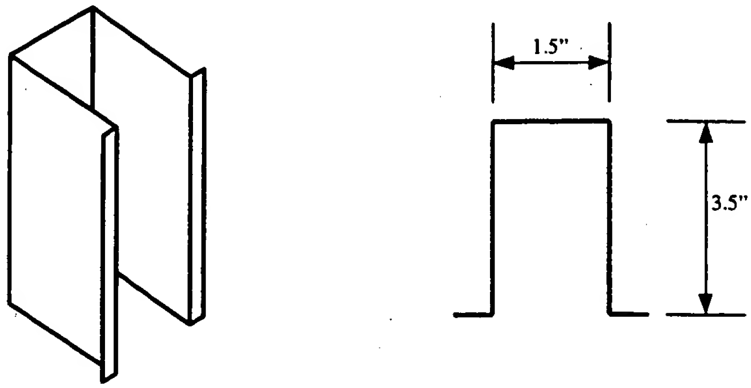

Figure 7 – Standard End Cap

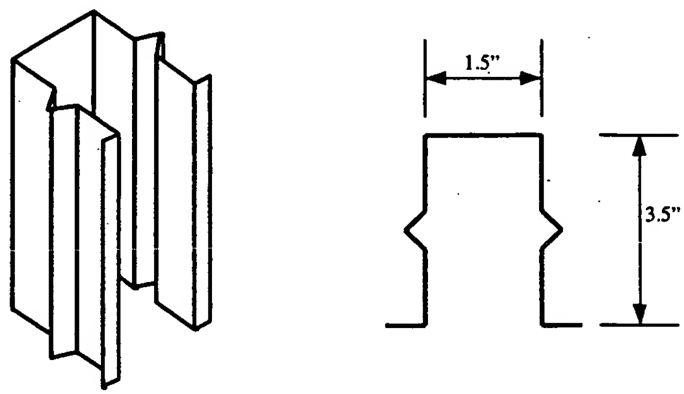

Figure 8 – Stiffened End Cap

3.0 Test Results

Tensile Coupon Tests

The mechanical properties of the steel used for the SteelJoist™ specimens were established by standard tensile coupon tests as described previously. Table A1 (Appendix A) lists the tensile test data for yield strength (F_y), ultimate tensile strength (F_u), uncoated steel thickness (t) and percent elongation in 2-inch (5.1 cm) gage length. Mean property values shown in Table A2 of Appendix A were used for analytical purposes.

Shear Tests

Four SteelJoist™ were tested for shear strength. The results are tabulated in Table A4 of Appendix A. Table 2 shows the average shear capacity at peak loads per web, V_t.

Table 2
Shear Test Results

SteelJoist™ Size[1]	Span Length (in.)	V_t (lb.)
12 x 33	24	1,402
12 x 43	24	2,371
12 x 33 w/end caps	24	3,246
12 x 43 w/end caps	24	4,556

[1]Refer to Table 1 for actual joist dimensions.

Bending Tests

A total of four SteelIJoist™ specimens were tested for bending strength. The results are tabulated in Table A4 of Appendix A. Joist mid-span deflections were also recorded and tabulated in Table A5 of Appendix A. The average ultimate capacity, per joist, at peak load, $P_{u(test)}$, for each joist type is recorded in Table 3. Table 3 also lists the average ultimate moment capacity, M_t, for each test specimen computed on the basis of the average ultimate peak load, $P_{u(test)}$.

Table 3
Bending Test Results

SteelIJoist™ Size[1]	Span Length (in.)	$P_{u(test)}$ (lb.)	Deflection @ $P_{u(test)}$[2] (in.)	M_t (in-lb)
12 x 33	216	2,100	1.44	75,600
12 x 43	216	2,894	1.76	104,184

[1]Refer to Table 1 for actual joist dimensions.
[2]Deflection measurements were taken at mid-span.

Combined Shear and Bending Tests

A total of four SteelIJoist™ specimens were tested and failed in combined shear and bending. The results are tabulated in Table A4 of Appendix A. Table 4 shows the average ultimate capacity at peak load, $P_{u(test)}$, the ultimate shear load, V_t, computed as ($0.69P_{u(test)}/2$), and the ultimate bending moment, M_t, computed on the basis of V_t.

Table 4
Combined Shear and Bending Test Results

SteelIJoist™ Size[1]	Span Length (in.)	$P_{u(test)}$ (lb.)	V_t (lb.)	M_t (in-lb)
12 x 33	120	4,124	1,423	23,136
12 x 43	120	5,604	1,933	31,438

[1]Refer to Table 1 for actual joist dimensions.

Mid-Span Loading with Cut Webs or Drilled Clinches Tests

A total of one 6-foot, 18 gauge and one 6-foot, 20 gauge SteelIJoist™ were tested as simply supported spans subjected to a point load at mid-span to establish a base line capacity. Another 6-foot, 18 gauge and 6-foot, 20 gauge SteelIJoist™ specimens were tested with every other clinches drilled out. Two 6-foot, 20 gauge and two 6-foot, 18 gauge SteelIJoist™ specimens were also tested with the webs between the trapezoidal openings cut out. The webs at the ends of the joists remained uncut. The results are tabulated in Table A4 of Appendix A. Table 5 shows the average ultimate capacity at peak load, $P_{u(test)}$, and the ultimate bending moment, M_t, computed on the basis of $P_{u(test)}$.

Table 5
SteelJoist™ with Drilled Clinches and Web Cut Outs Test Results

SteelIJoist™ Size[1]	Span Length (in.)	Joist Condition	$P_{u(test)}$ (lb.)	Deflection @ $P_{u(test)}$[2] (in.)	M_t (in-lb)
12 x 33	72	Master Joist	2,162	0.350	38,916
12 x 43	72	Master Joist	3,468	0.340	62,424
12 x 33	72	Drilled Clinches	2,052	0.310	36,936
12 x 43	72	Drilled Clinches	3,277	0.380	58,986
12 x 33	72	Webs Cut Out	2,065	0.345	37,170
12 x 33	72	Webs Cut Out	3,178	0.378	57,204

[1]Refer to Table 1 for actual joist dimensions.
[2]Deflection measurements were taken at mid-span.

Rim Joist Tests

A total of three SteelIJoist™ rim joist specimens were tested for bending strength. The results are tabulated in Table A4 of Appendix A. Joist mid-span deflections were recorded and tabulated in Table A5 of Appendix A. The average ultimate capacity at peak load, $P_{u(test)}$, for each rim track is recorded in Table 6. Table 6 also lists the average ultimate moment capacity, M_t, for each test specimen computed on the basis of the average ultimate peak load, $P_{u(test)}$.

Table 6
Rim Track Test Results

Rim Joist Size	Span Length (in.)	$P_{u(test)}$ (lb.)	Deflection @ $P_{u(test)}$[1] (in.)	M_t (in-lb)
12 x 43	96	2,333	0.440	37,328
12 x 43	72	4,426	0.355	53,112

[1]Deflection measurements were taken at mid-span.

End Cap Tests

A total of six SteelIJoist™ end caps were tested for compressive strength. The results are tabulated in Table A4 of Appendix A. The average ultimate capacity at peak load, $P_{u(test)}$, for each end cap is recorded in Table 7.

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Table 7
End Cap Compression Test Results

End Cap Thickness (mil)	End Cap Configuration	End Cap Height (in.)	$P_{n(test)}$ (lb.)
43	Unstiffened	12	11,323
43	Stiffened	12	17,789

Failure Modes

<u>Shear</u>

The maximum shear stress occurs at mid-depth of the web. Where web material is removed as for a web opening, a stress concentration is created at the corners of the opening that typically creates premature shear failure of the SteelIJoist™. This failure mode, however, was not observed in the shear tests. In all specimens tested for shear, the failure mode was not pure shear failure. Failure occurred mainly due to web buckling, flange curling, web rotation, and/or stiffener buckling. This is a clear indication that SteelIJoist™ joists will not typically fail in shear.

<u>Bending</u>

For bending test specimens, the failure pattern is defined by either local buckling or mixed local and lateral-torsional buckling. The lateral-torsional buckling mode would typically result in premature web failure of test specimens. The test specimens did not show signs of lateral-torsional buckling. All test specimens failed in local buckling and yielding. The OSB and gypsum board strips provided adequate lateral strength to prevent the lateral-torsional mode of buckling. No deformation of the web openings was observed at failure of any of the specimens. Failed specimens were not severely deformed.

<u>Combined Bending and Shear</u>

For test specimens that failed by the combined shear and bending behavior, the failure pattern occurred as a bending type failure at mid-span and a diagonal shear failure between the load points. These two failure modes occurred simultaneously as the ultimate load was achieved. Folded edges at web openings or web stiffeners did not show any deformation at failure loads.

<u>Mid-Span Loading with Cut Webs or Drilled Clinches</u>

The failure pattern for these specimens was similar to the joists tested and failed in bending. Beam specimen with drilled clinches showed slight separation between the clinched sheets of the steel that are located within a close proximity to the loading plates. Deformation or failure of the clinches was not observed.

Beams with cut webs also exhibited a similar failure pattern to those beams tested for bending loads. Failure occurred by buckling in the webs within a close proximity to the loading plates.

Rim Joists

The 8-foot rim-joist specimen failed prematurely due to warping and lateral torsional buckling. The ends were

End Caps

All end-caps failed in column buckling at approximately mid-height.

4.0 Analysis of Test Data

The SteelIJoist™ performed extremely well in all tests. The bending, shear, and combined shear and bending strengths are well above those of a typical C-shaped 12-inch joist. Mid-span deflections were also within the recommended deflection limit (L/360 or L/480) that is usually used in designing residential and light commercial buildings.

Shear tests showed that a SteelIJoist™ would perform better with end caps fastened to the ends of the joists. End caps are also necessary to eliminate potential failures due to web crippling.

Reducing the Number of Clinches

Tests with every other clinch drilled out resulted in a SteelIJoist™ ultimate capacity that is within 5 percent of that of a standard SteelIJoist™. Therefore, increasing the spacing between clinches will have negligible impact on the overall performance of the SteelIJoist™.

Cutting the Webs between Openings

Tests with webs between openings cut out (except for the end webs) resulted in a SteelIJoist™ ultimate capacity that is within 5 percent of that of a SteelIJoist™ without web cut outs. Therefore, cutting the webs along the length of a SteelIJoist™ will have negligible impact on the overall performance of the SteelIJoist™.

Changing Number of Screws

Tests performed on SteelIJoist™ specimens with end caps fastened with 3-#10 screws instead of 5-#10 screws resulted in a capacity that is similar to those with 5-#10 screws. Therefore, end caps fastened to a SteelIJoist™ with 3-#10 screws should perform its intended function adequately.

SteelIJoist™ Allowable Loads

Table 8 summarizes the allowable tested values (using a factor of safety of 2.0 as calculated in Appendix B).

Table 8
Tested Allowable Loads

SteelJoist™ Size[1] (Web depth x thickness)	Failure Mode[2]	Tested Ultimate Load[3] lb.	Allowable Tested Load[4] lb.
12 x 33	Shear	1,402	701
12 x 33	Shear w/end caps	3,246	1,623
12 x 33	Bending	2,100	1,050
12 x 33	Shear & Bending	4,124	2,062
12 x 43	Shear	2,371	1,186
12 x 43	Shear w/end caps	4,556	2,278
12 x 43	Bending	2,894	1,447
12 x 43	Shear & Bending	5,604	2,802

[1]Refer to Table 1 for actual joist dimensions.
[3]Values are based on an average of two tests (minimum) per configuration.
[4]The allowable tested load is calculated as the tested "ultimate" load divided by a factor of safety of 2.0 (refer to Appendix B).

Table 9 provides the SteelJoist™ maximum allowable spans for residential floors. The spans are based on a maximum uniform live load of 30 and 40 psf and maximum floor dead load of 10 psf.

Table 9
Allowable Spans for SteelJoist™ Floor Joists[1]

SteelJoist™ Depth	Steel ThicknessGauge	30 psf Live Load				40 psf Live Load			
		SteelJoist™ O.C. Spacing				SteelJoist™ O.C. Spacing			
		12"	16"	19.2"	24"	12"	16"	19.2"	24"
12	20	25'-1"	21'-9"	19'-11"	17'-9"	22'-5"	19'-5"	17'-9"	15'-11"
12	18	29'-6"	25'-6"	23'-4"	20'-10"	26'-4"	22'-9"	20'-10"	18'-8"

[1]All steels shall have minimum yield strength of 50 ksi.

5.0 Summary, Conclusion and Recommendation

The objective of this investigation was to study the behavior of SteelJoist™ floor joist members with trapezoidal web openings with folded edges subjected to shear, bending, and combined shear and bending. The trapezoidal web opening had folded edges that stiffened the web around the opening. A total of 39 tests were performed. Based on the findings of this study, the following conclusions and recommendations regarding the behavior and installation of SteelJoist™ floor joists with relatively large, stiffened openings (i.e. folded edges) under gravity loads can be made:

- The presence of trapezoidal web openings with folded edges did not reduce the ultimate shear, bending, and combined shear and bending strengths. Actually, the folded edge web openings resulted in an increase in the strength of joist specimens investigated in this study.

- The presence of trapezoidal web openings did not promulgate any failure. All observed failures took place at a distance from the openings. None of the web openings experienced any significant deformation under any of the loading conditions examined.

- Shear strength was not a controlling factor in the design of SteelJoist™ joists with web openings as identified in this report. Pure shear failure did not occur in any of the tested specimens.

- SteelJoist™ joists with trapezoidal web openings (with folded edges) can be safely used in residential and light commercial construction to accommodate long septic drains, plumbing runs, routing of ductwork, and other trade installations.

- SteelJoist™ joists provide clear unsupported spans that exceed those for typical C-shaped joists by approximately 25%. This would allow the end user to drop at least one gauge for a particular span. The SteelJoist™ joist allows the end user to utilize lighter gauge steels that are not available in regular C-shaped joists. Using lighter gauge steels would result in lower material and labor costs (especially fastening time).

- The on center spacing between the clinches can be safely increased to 4 or 5-inches without any degradation in the strength of the joist.

- One web of each trapezoidal opening can be safely removed without any degradation in the strength of the joist (webs should not be removed at either end of the joist).

- The number of screws connecting the end caps to the SteelJoist™ ends can be reduced to 3-#10 screws without degrading the strength of the joist. Further reduction in the number of screws per side should be investigated.

- The top and bottom chord flange widths of 1-1/2" could cause a problem for fastening sheathing and drywall to the joist. A minimum of 1-5/8" flanges should be specified. This would give the framers more flat surface to accommodate two sheets of sheathing and would eliminate potential concerns by end users. This change would also make the SteelJoist™ flange width similar to that specified for typical C-shaped joists.

- A 10-inch deep SteelJoist™ is expected to behave as well as or better than the 12-inch deep joist tested in this report. This will result in tremendous savings in steel and provides an additional 2-inches of headroom.

- Web openings foldouts have sharp edges. This would cause significant concerns to sub-trade installations. Sharp edges should be smoothed out.

- The end-cap connection to the joist requires an added effort that could impact the efficiency or cost-effectiveness of the SteelJoist™. A better connection detail utilizing the rim track should be investigated.

6.0 References

[1] ASTM A 370- 1997a, *Standard Test Methods and Definitions for Mechanical Testing of Steel Products*, American Society for Testing and Materials (ASTM), West Conshohocken, PA.

[2] ASTM A 90/A90M-1995, *Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings,* American Society for Testing and Materials (ASTM), West Conshohocken, PA.

[3] ASTM D 198-1997, *Standard Test Methods of Static Tests of Lumber in Structural Sizes.* American Society for Testing and Materials (ASTM), West Conshohocken, PA.

APPENDIX A

TEST RESULTS

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Table A1
Physical and Mechanical Properties of Test Specimens

SteelJoist™ Size (web depth x thickness)	Web Size (in)	Top Chord Width (in)	Bottom Chord Width (in)	Thickness (mil)	Yield Point[1] (ksi)	Tensile Strength[1] (ksi)	Uncoated Thickness[2] (in.)	Elongation[3] (percent)
12x33	12	1.5	1.5	33	51,025	61,560	0.0345	15.1
12x33	12	1.5	1.5	33	52,340	61,395	0.0347	16.2
12x33	12	1.5	1.5	33	51,780	61,508	0.0348	15.9
12x43	12	1.5	1.5	43	52,220	61,468	0.0465	14.8
12x43	12	1.5	1.5	43	51,980	62,120	0.0468	16.1
12x43	12	1.5	1.5	43	51,800	61,030	0.0465	15.8

[1]Tested per ASTM A 370 [14].
[2]Tested per ASTM A 90 [15].
[3] Tested per ASTM A 370 [14] for a 2-inch gauge length.

Table A2
Mean Physical and Mechanical Properties of Test Specimens[1,2]

SteelJoist™ Size (web depth x thickness)	Yield Point (ksi)	Tensile Strength (ksi)	Uncoated Thickness (in.)	Elongation (percent)
12 x 33	0.0347	51,715	61,488	15.7
12 x 43	0.0467	52,000	61,539	15.6

[1]Values shown represent the mean of three tests per specimen.
[2]Refer to Table A3 for standard deviation and coefficient of variation (COV).

Table A3
Standard Deviation and Coefficient of Variation of Physical and Mechanical Properties

SteelJoist™ Size (web depth x thickness)	Standard Deviation (σ)		
	Yield Strength (ksi)	Tensile Strength (ksi)	Uncoated Thickness (in.)
12 x 33	660	84	0.568
12 x 43	211	549	0.681
SteelJoist™ Size (web depth x thickness)	**Coefficient Of Variation (COV) [1]**		
	Yield Strength	**Tensile Strength**	**Uncoated Thickness**
12 x 33	0.013	0.001	0.036
12 x 43	0.004	0.009	0.044

[1] COV equals the standard deviation divided by the mean.

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Table A4
Tested Ultimate Capacity of SteelJoist™

Test No.	SteelJoist™ Size [1]	Joist Thickness (gauge)	Joist Span (ft-in.)	Test Mode	Ultimate Load [2] (lb)	Mid-span Deflection [3] (in)
1	12 x 33	20	2'-0"	Shear	1,371	0.165
2	12 x 33	20	2'-0"	Shear	1,432	0.137
3	12 x 33	20	10'-0"	Shear & Bending	3,936	0.435
4	12 x 33	20	10'-0"	Shear & Bending	4,312	0.400
5	12 x 33	20	18'-0"	Bending	4,114 (4)	1.400
6	12 x 33	20	18'-0"	Bending	4,284 (4)	1.480
7	12 x 43	18	2'-0"	Shear	2,305	0.180
8	12 x 43	18	2'-0"	Shear	2,436	0.230
9	12 x 43	18	10'-0"	Shear & Bending	5,812	0.430
10	12 x 43	18	10'-0"	Shear & Bending	5,396	0.375
11	12 x 43	18	18'-0"	Bending	5,786 (4)	1.760
12	12 x 43	18	18'-0"	Bending	5,787 (4)	1.760
13	12 x 33	20	2'-0"	Shear with end caps	3,202	0.135
14	12 x 33	20	2'-0"	Shear with end caps	3,289	0.130
15	12 x 43	18	2'-0"	Shear with end caps	4,632	0.138
16	12 x 43	18	2'-0"	Shear with end caps	4,479	0.115
17	12 x 33	20	6'-0"	Mid-span loading	2,162	0.350
18	12 x 33	20	6'-0"	Drilled clinches	2,052	0.310
19	12 x 33	20	6'-0"	Cut webs	2,025	0.290
20	12 x 33	20	6'-0"	Cut webs	2,105	0.400
21	12 x 43	18	6'-0"	Mid-span loading	3,468	0.340
22	12 x 43	18	6'-0"	Drilled clinches	3,277	0.380
23	12 x 43	18	6'-0"	Cut webs	3,139	0.335
24	12 x 43	18	6'-0"	Cut webs	3,216	0.420
25	12 x 43	18	8'-0"	Rim Joist	2,333	0.440
26	12 x 43	18	6'-0"	Rim Joist	4,513	0.390
27	12 x 43	18	6'-0"	Rim Joist	4,338	0.320
28	End cap	18	12"	Unstiffened end cap	11,034	-
29	End cap	18	12"	Unstiffened end cap	11,800	-
30	End cap	18	12"	Unstiffened end cap	11,135	-
31	End cap	18	12"	Stiffened end cap	16,150	-
32	End cap	18	12"	Stiffened end cap	18,034	-
33	End cap	18	12"	Stiffened end cap	19,183	-

[1] Refer to Table 1 for actual joist dimensions.
[2] The ultimate load is the total vertical load applied to the joist at peak load.
[3] Mid-span deflections recorded at ultimate loads.
[4] Ultimate load for two joists.

APPENDIX B

SAFETY FACTOR CALCULATION

SAFETY FACTOR CALCULATION

The factor of safety used in estimating the tested allowable loads from the tested ultimate loads, in Table 11 is calculated in accordance with Section F of the AISI Design Specification [3] as follows:

The allowable axial capacity $R_a = R_n/\Omega$.

Where: R_n = Average value of the test results.
Ω = Factor of safety = $1.6/\phi$

ϕ	= Resistance factor = $1.5(M_m F_m P_m)e^{-\beta_0\sqrt{V^2{}_M+V^2{}_F+C_P V_P{}^2+V^2{}_Q}}$
M_m	= Mean value of the material factor = 1.10
F_m	= Mean value of the fabrication factor = 1.00
P_m	= Mean value of the professional factor for the tested component = 1.0
β_0	= Target reliability index = 2.5
V_M	= Coefficient of variation of the material factor = 0.10
V_F	= Coefficient of variation of the fabrication factor = 0.05
C_P	= Correction factor = 5.7
V_P	= Coefficient of variation of the test results = 4.65% (see note below)
V_P	= 4.65% (for $V_p < 6.5\%$, use 6.5%)
m	= Degree of freedom = 1
V_Q	= Coefficient of variation of the load effect = 0.21
ϕ	$= 1.5(1.10x1.00x1.00)e^{-2.5\sqrt{0.10^2+0.05^2+5.7x0.065^2+0.21^2}} = 0.81$

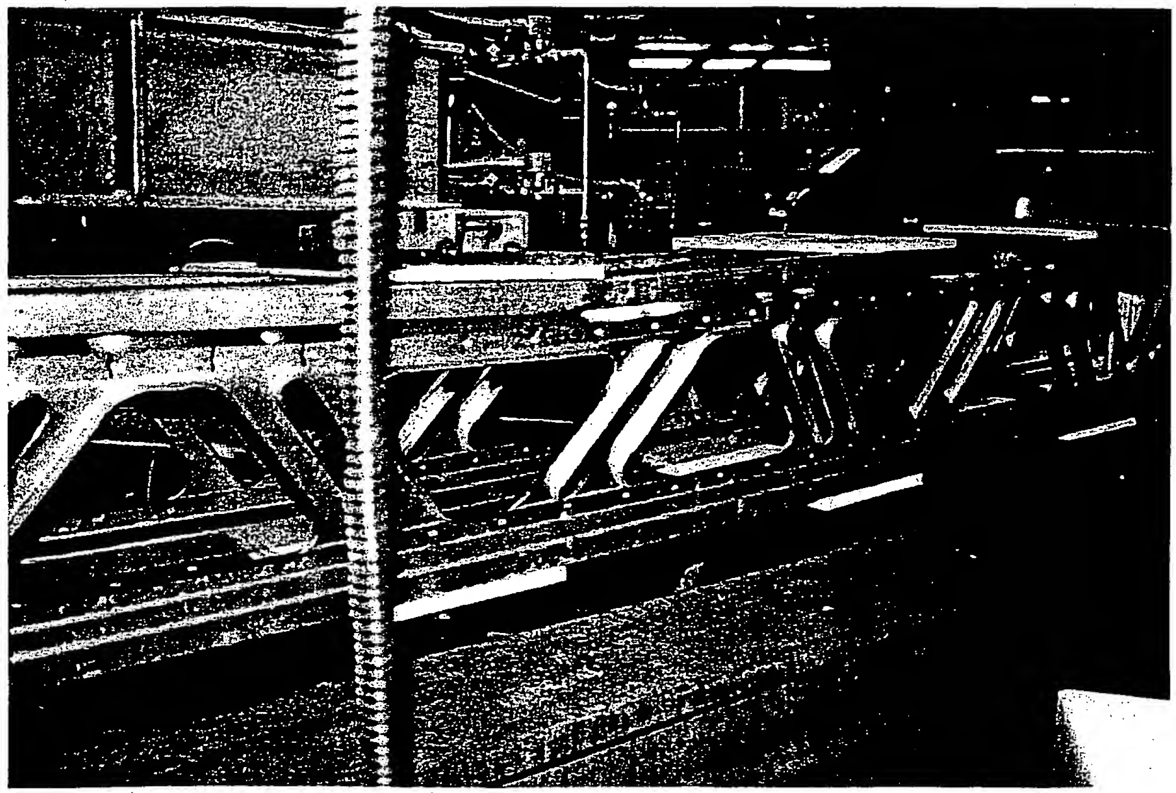
ϕ = 0.81

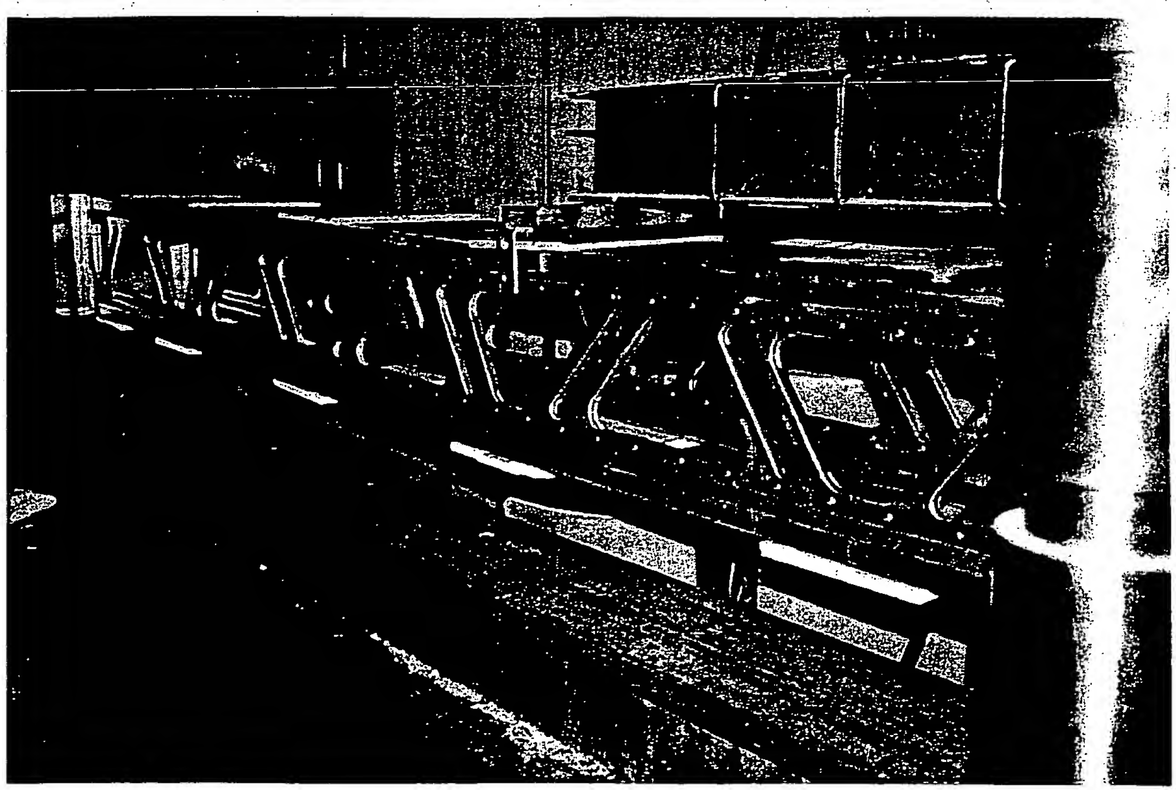
Ω = Factor of safety = $1.60/\phi$ = 1.60/0.81 = 1.975 (conservatively, use 2.0)

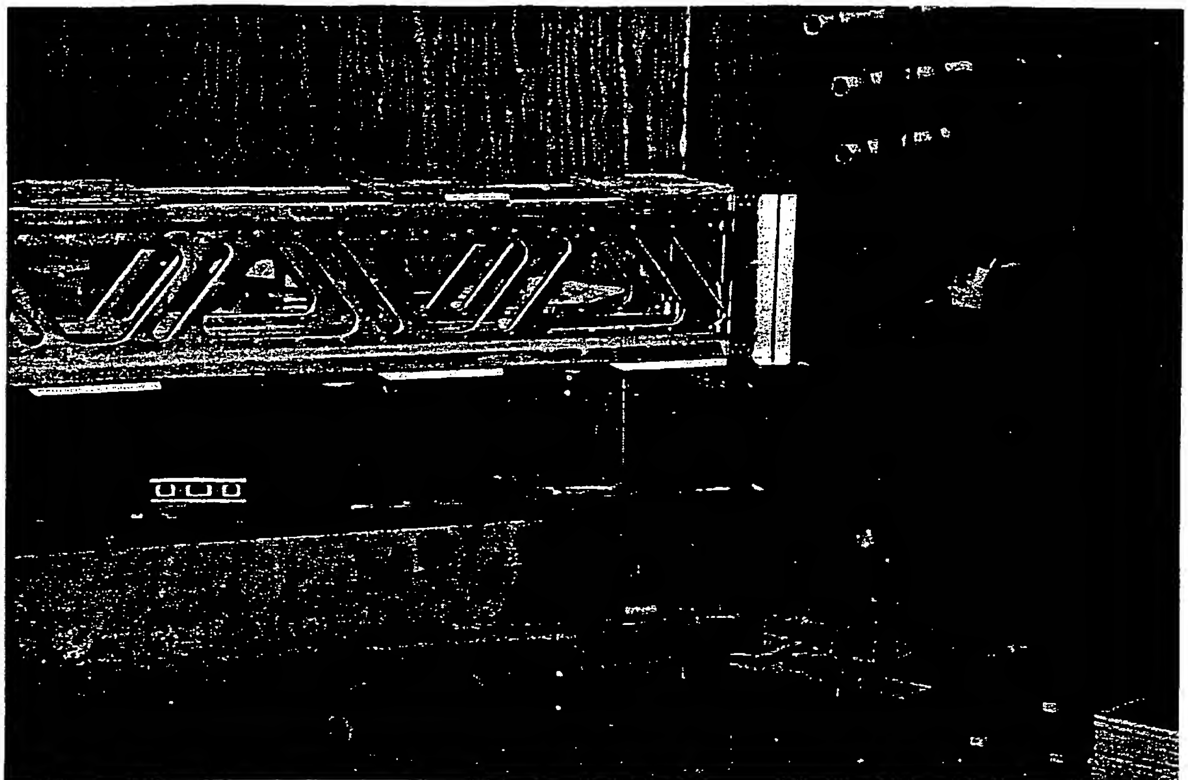
<u>Note:</u> The coefficient of variation (COV) of the test results is obtained by calculating the average COV of the individual COVs for each set of tests (minimum of two-test samples) and adding one standard deviation. The average COV is calculated to be 2.73 percent for all test groups. The standard deviation of all test group COVs is 1.92 percent. Therefore, the representative COV is 2.73 + 1.92 = 4.65. This represents an upper 64 percentile (plus one standard deviation) of the COV experience in the tests. It does not represent the "global" COV that may be experienced by multiple producers in various production runs. Considering this source variance in real production may tend to increase the safety factor estimate. The conservative bias relation to specific minimum strength versus actual strength is not considered in the safety factor determination. Considering this effect would tend to lower the safety factor estimate.

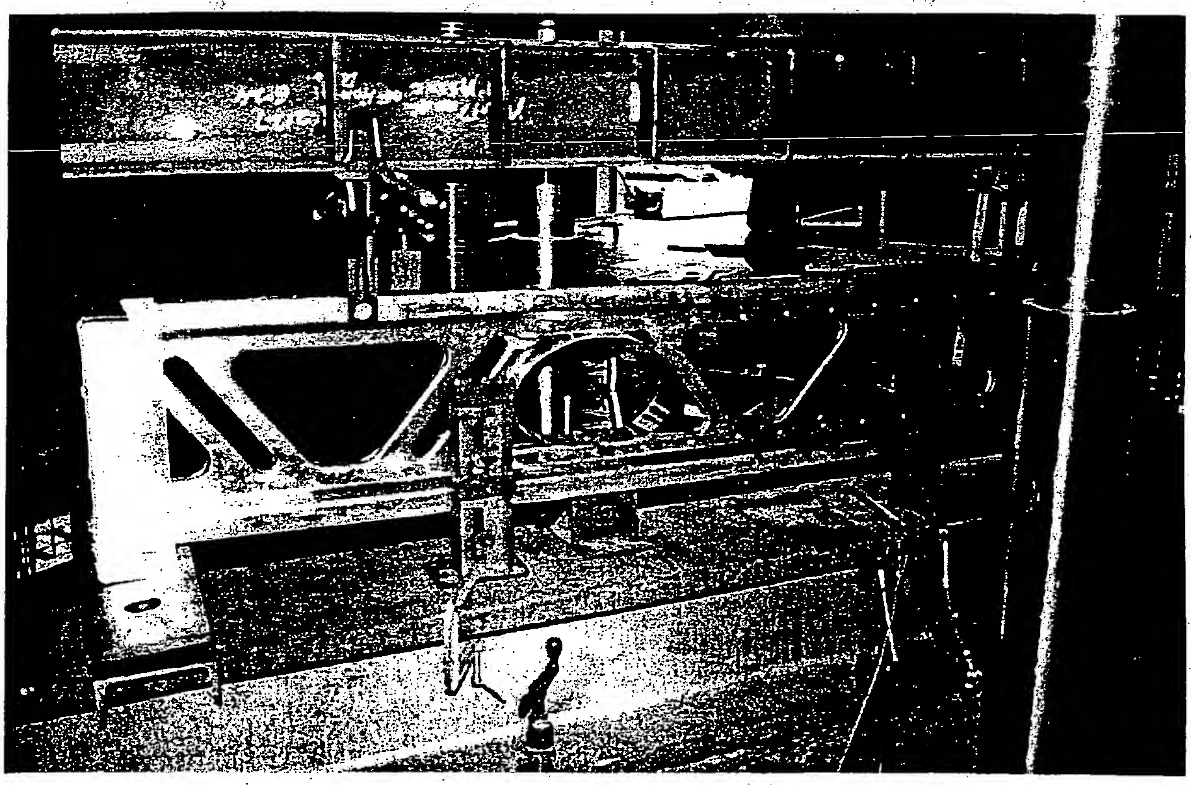
APPENDIX C

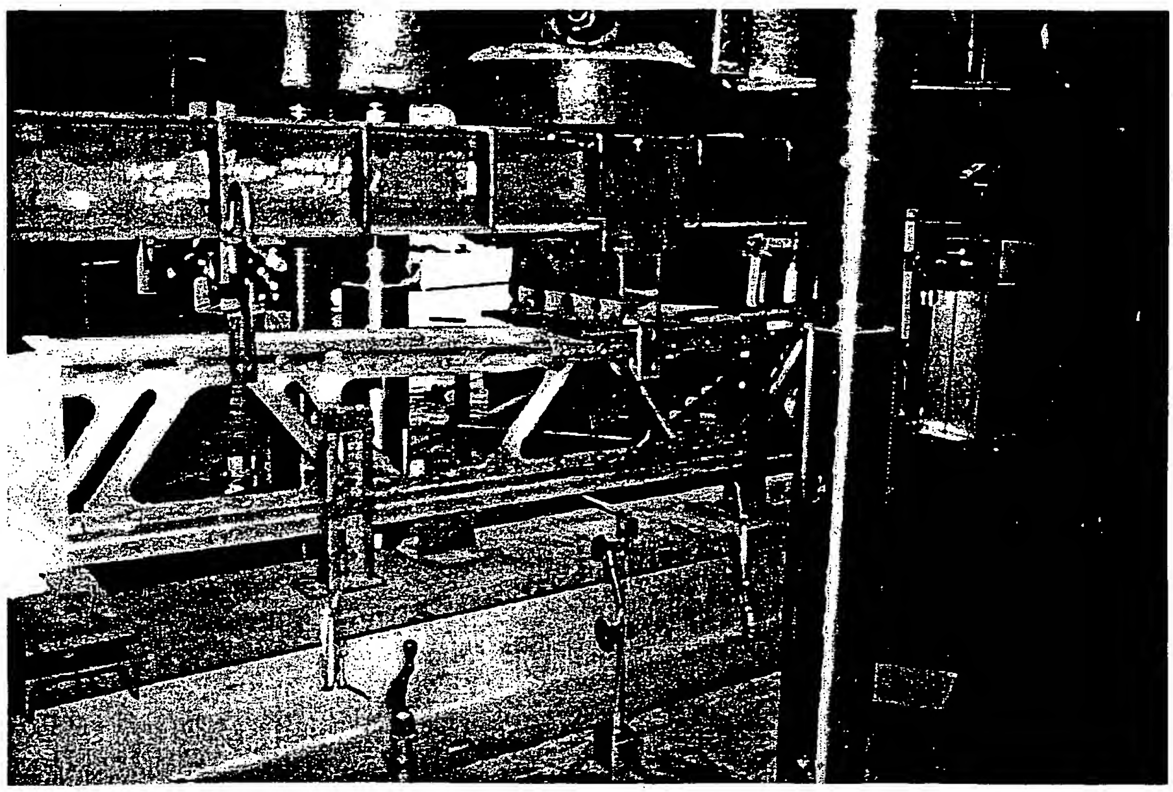
TEST PHOTOGRAPHS

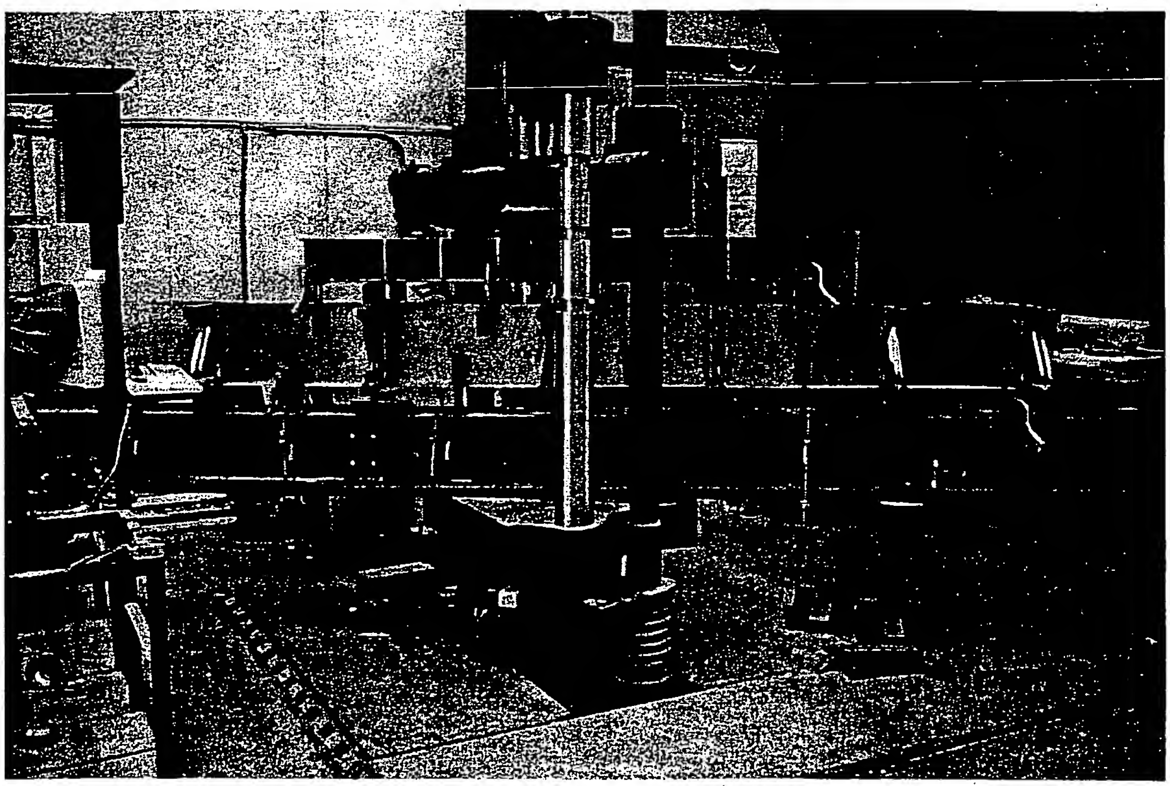












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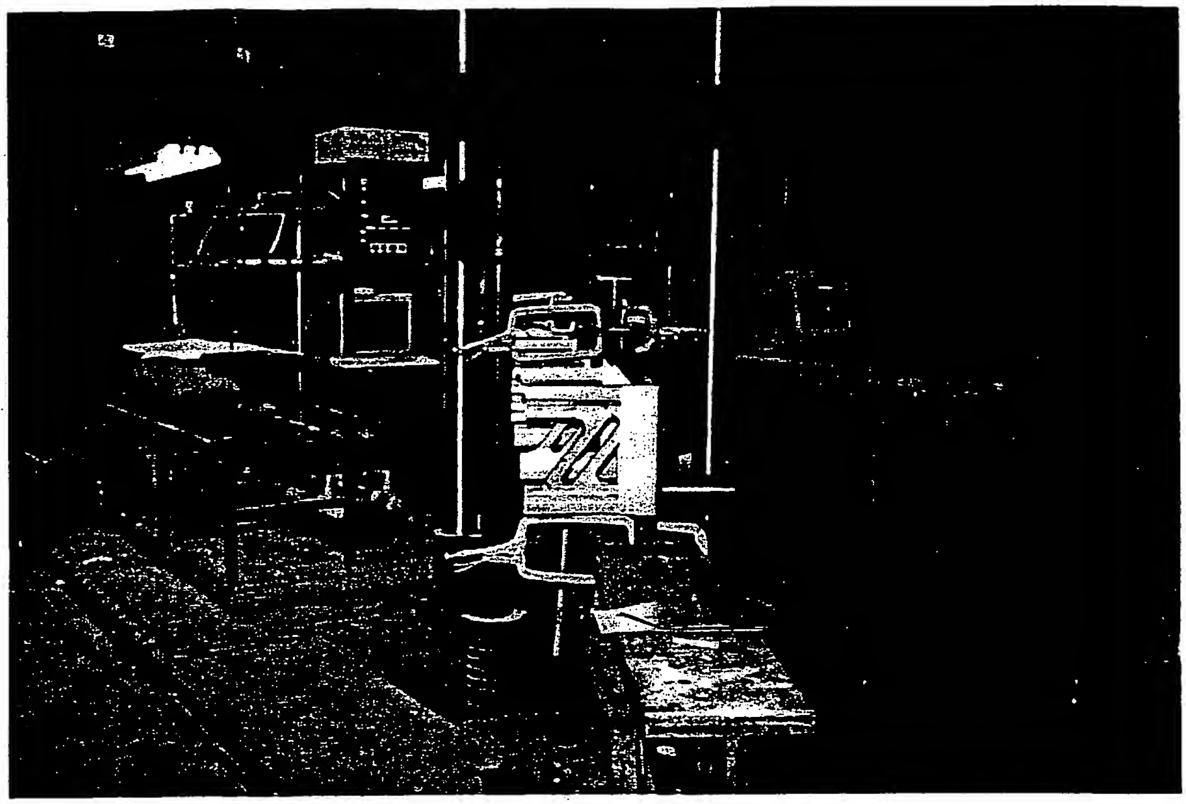
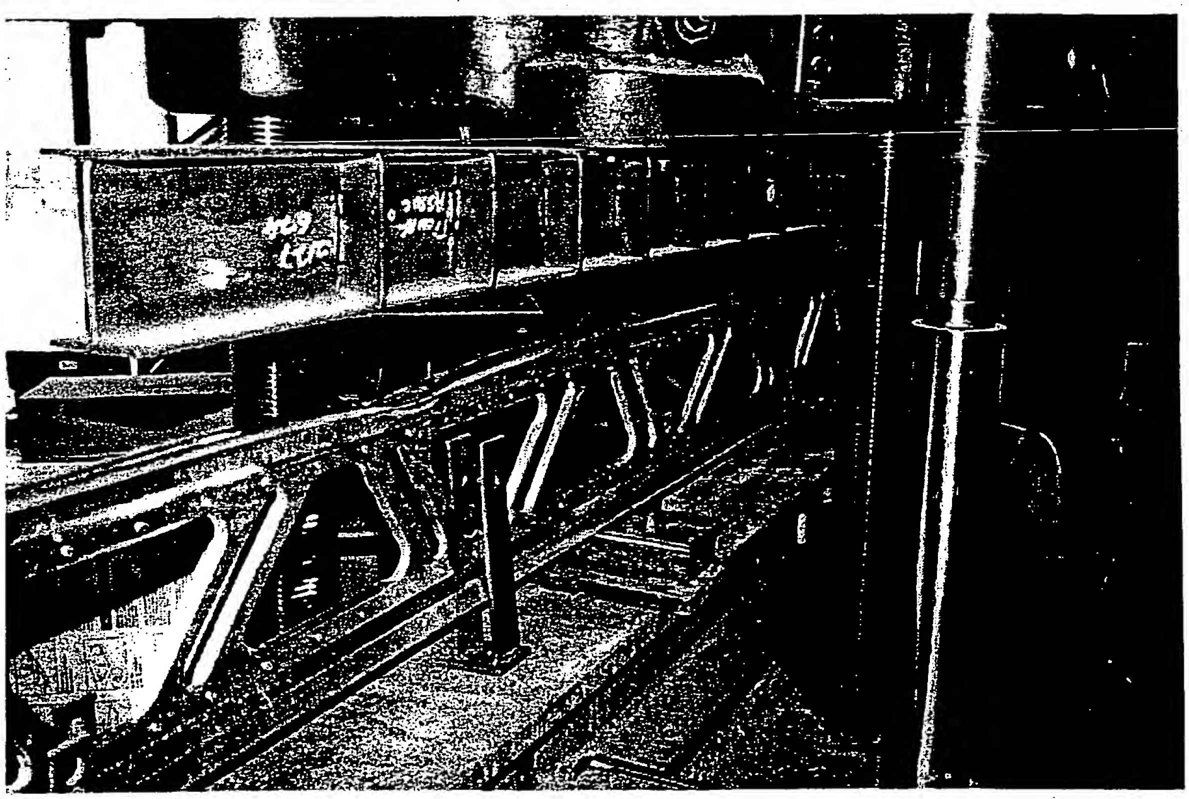
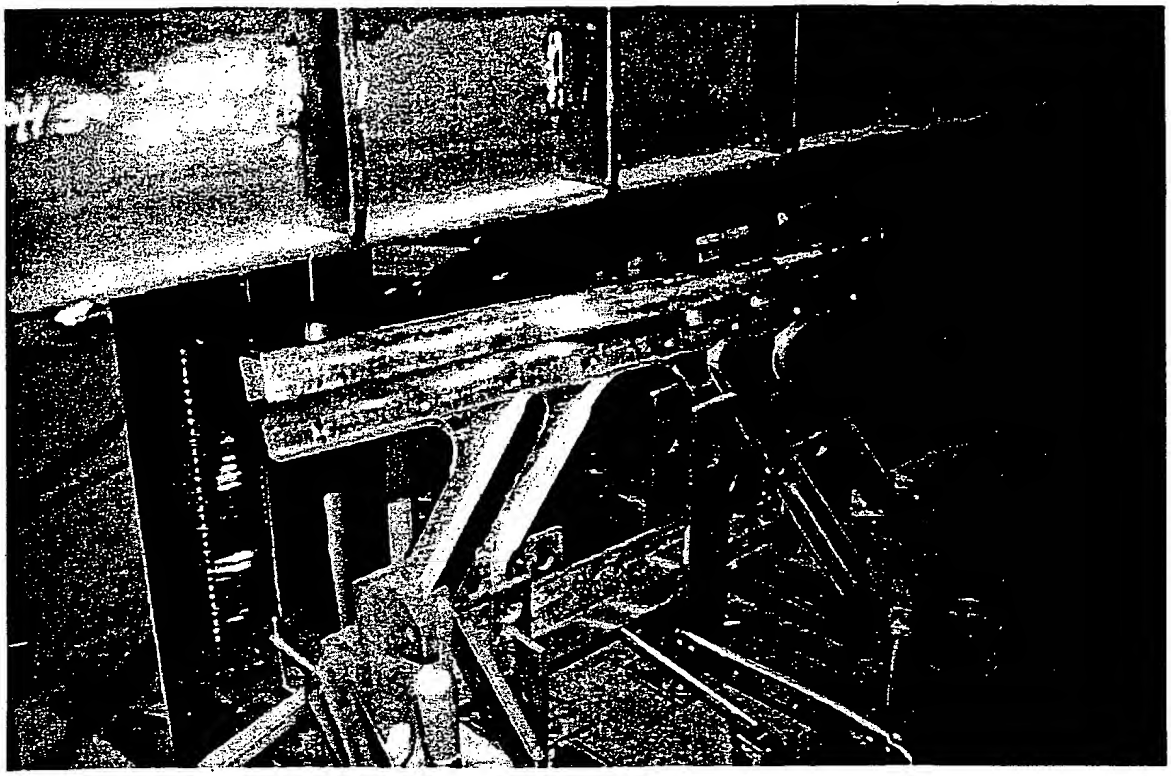
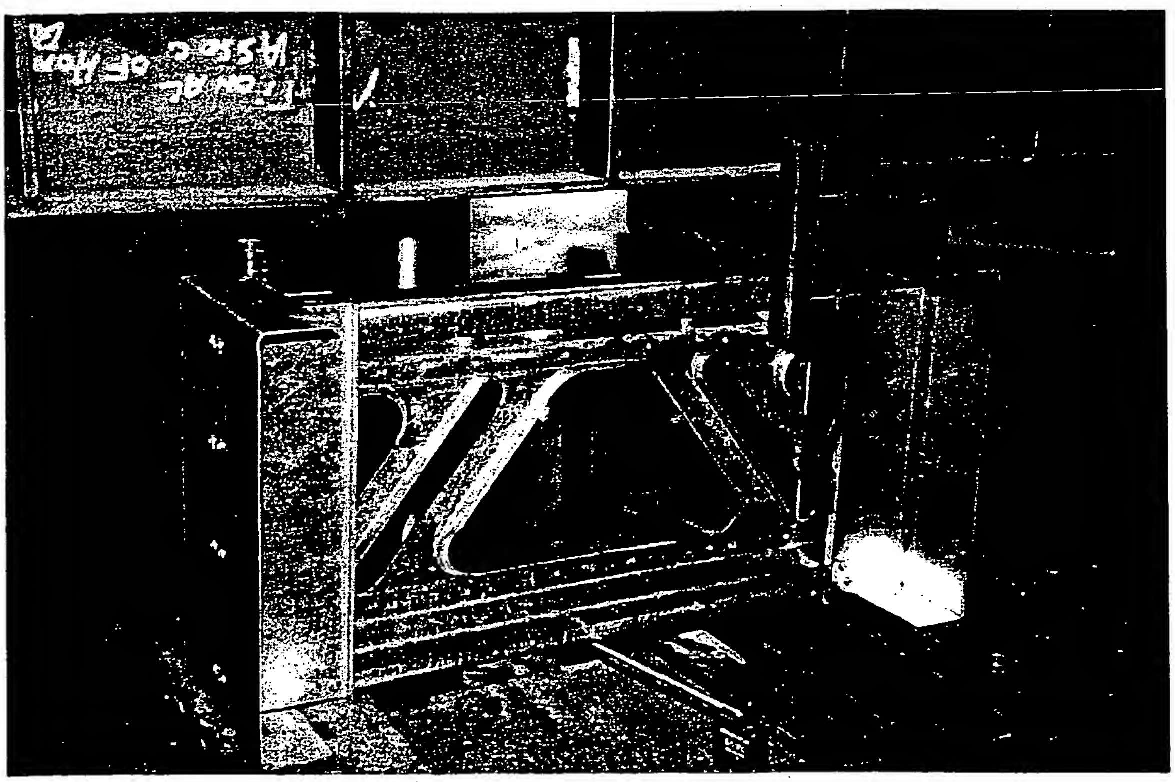
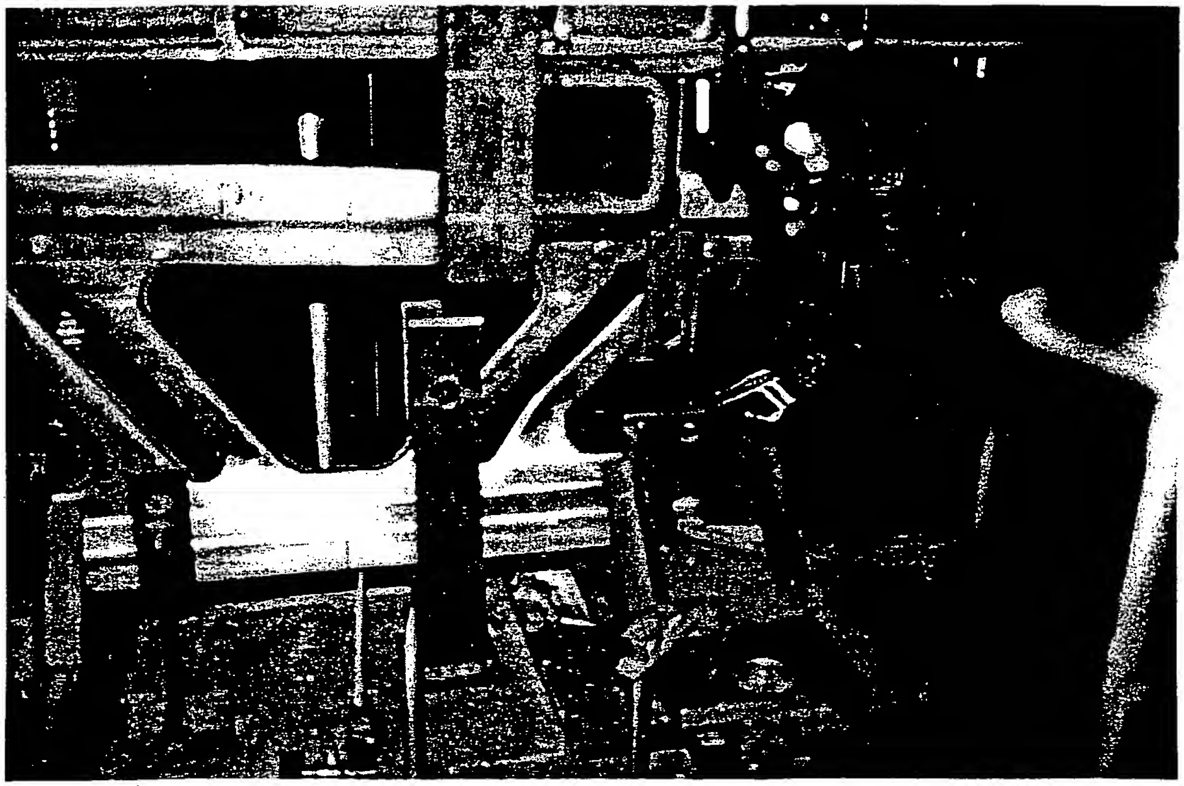








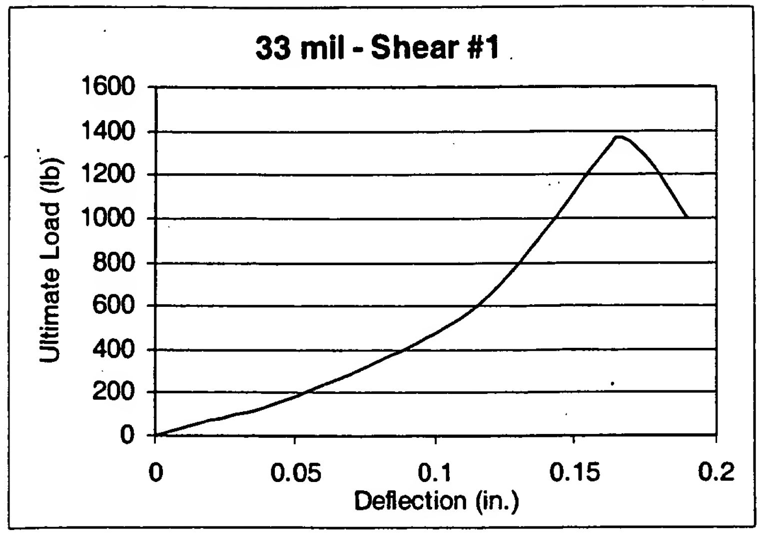


APPENDIX D

TEST PLOTS

1

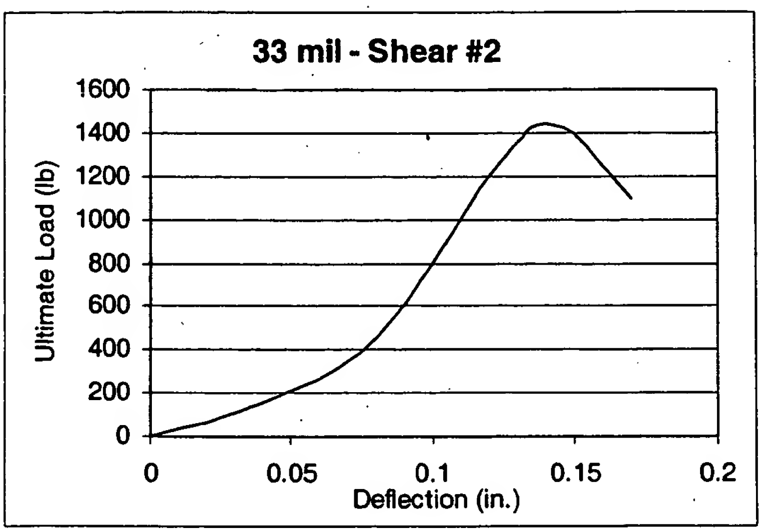
2' ~~20 GA~~



1371

2

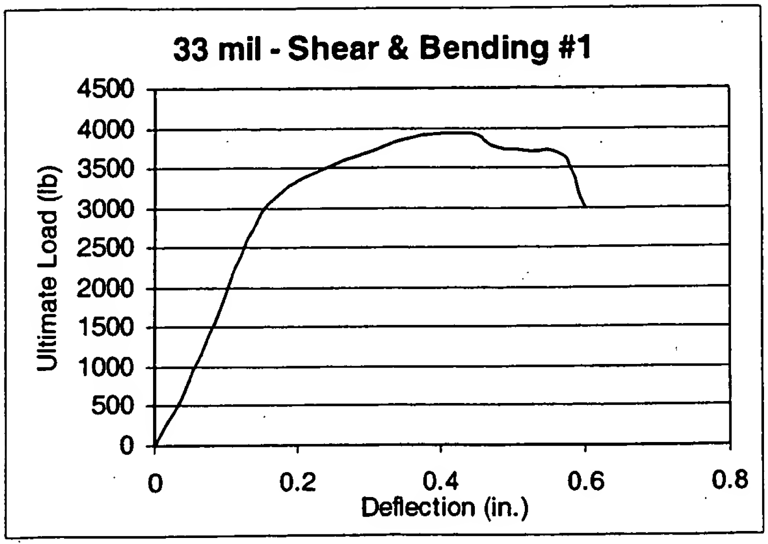
2' 20 GA



1432

3

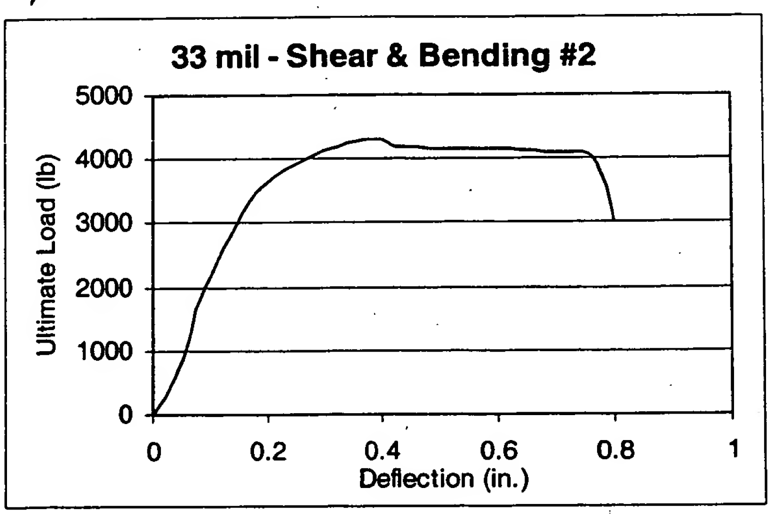
10' 20GA



3936

4

10' 20GA



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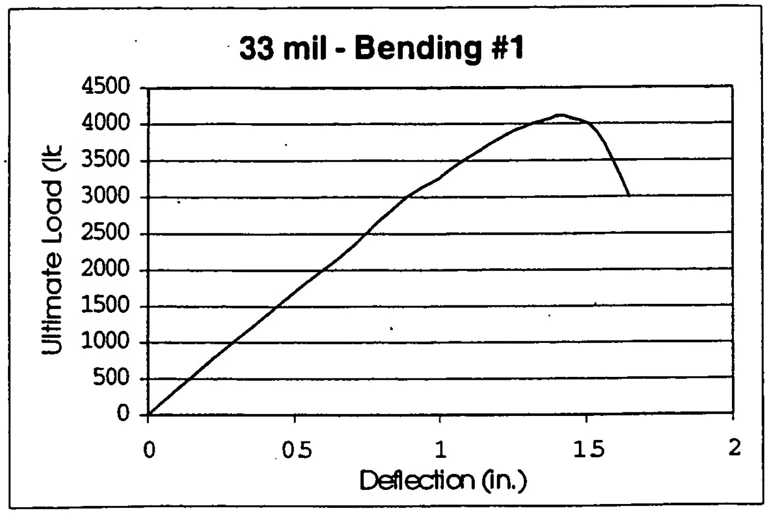
5



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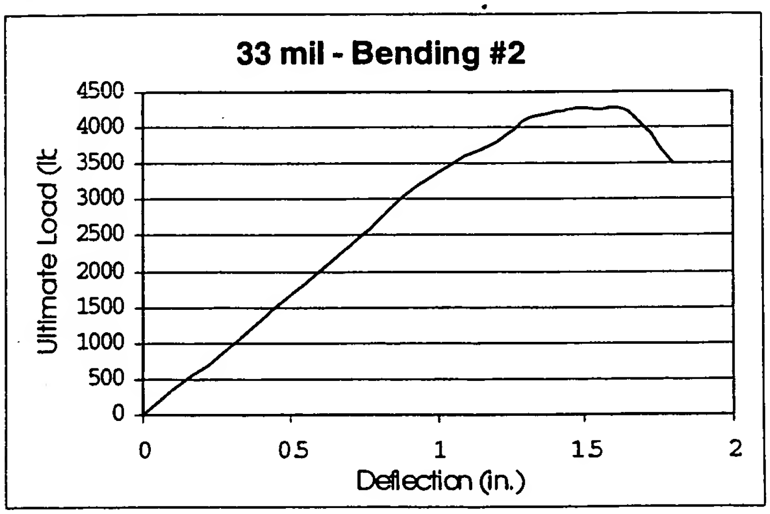
2 JOISTS
4114

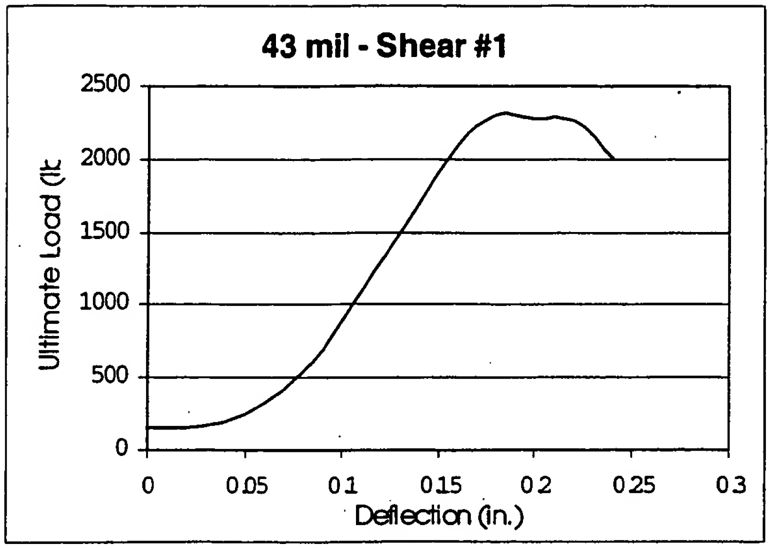
6



2- 18' 20 GA
2 JOISTS
4284

7

2' 18GA



2305

8

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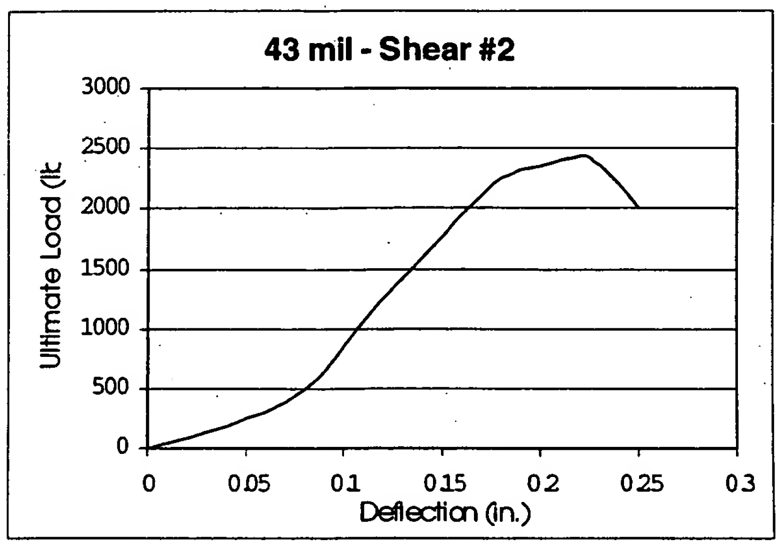
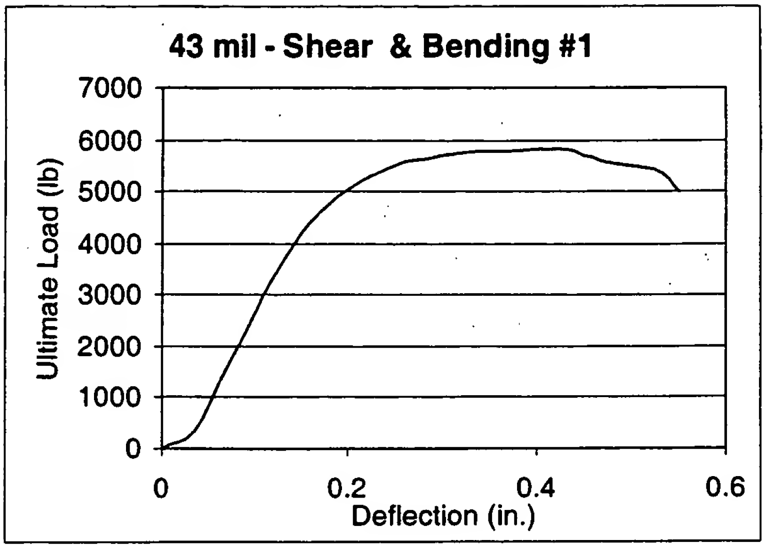


2436

9

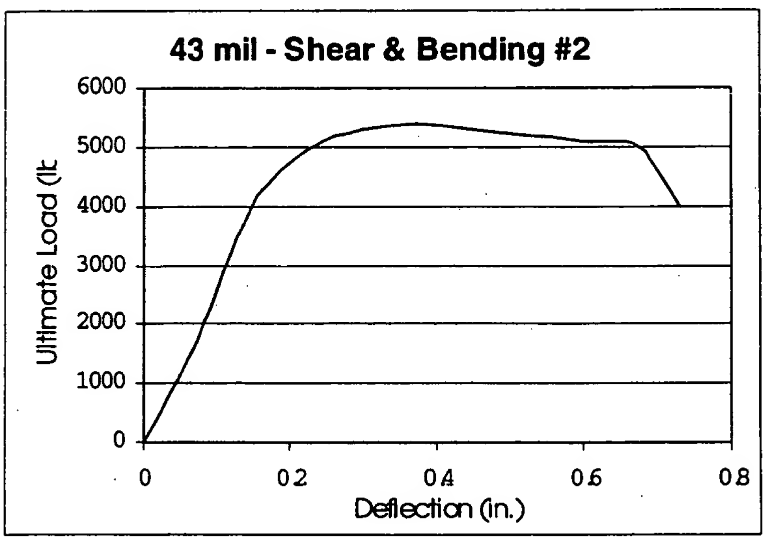
10' 18GA



5812

10

10' 18GA



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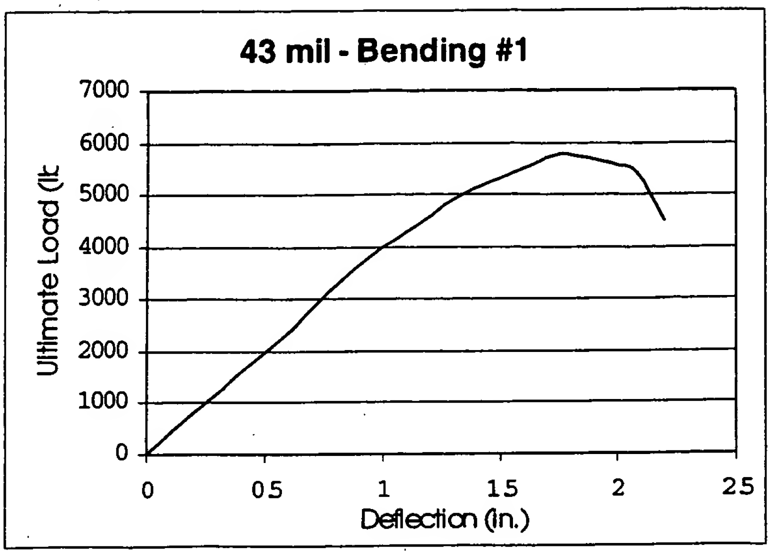
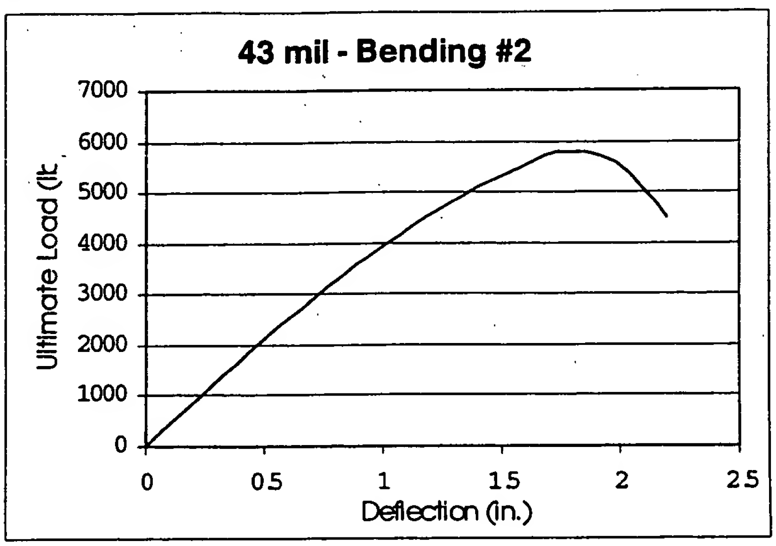


2 - 18' 18 GA
2 JOISTS
5786

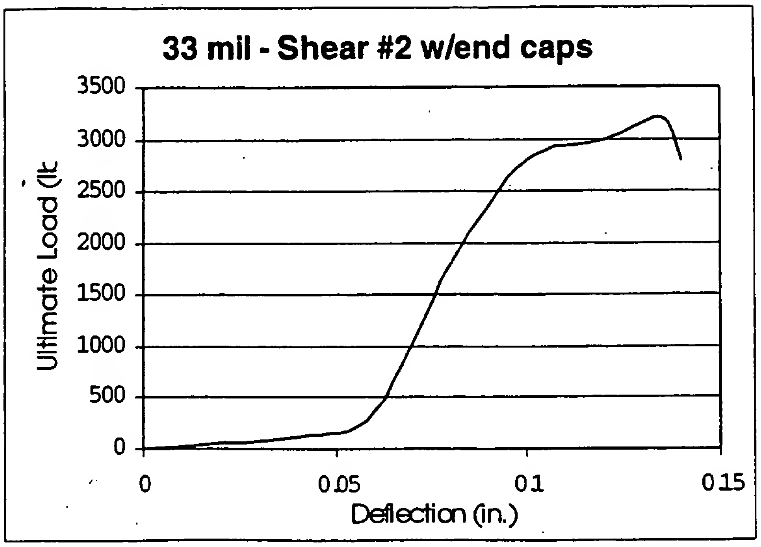
12



2 - 18' 18 GA
2 JOISTS
5787

13

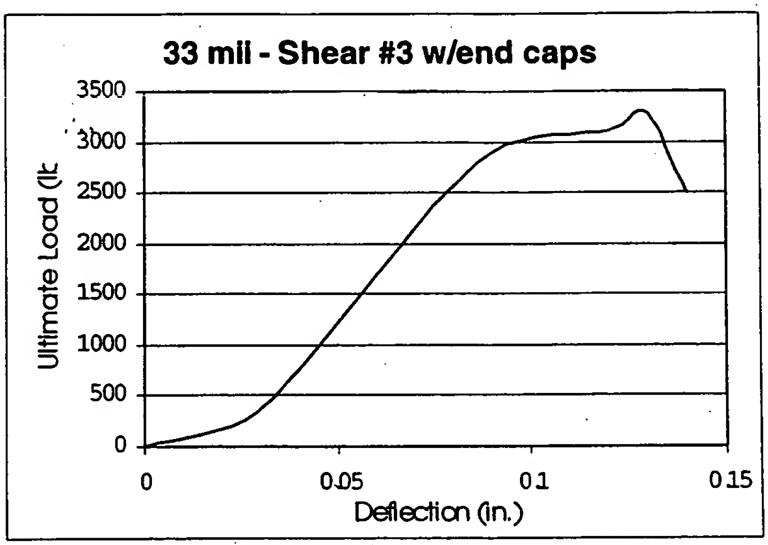
2' 20 GA



3202

14

2' 20 GA



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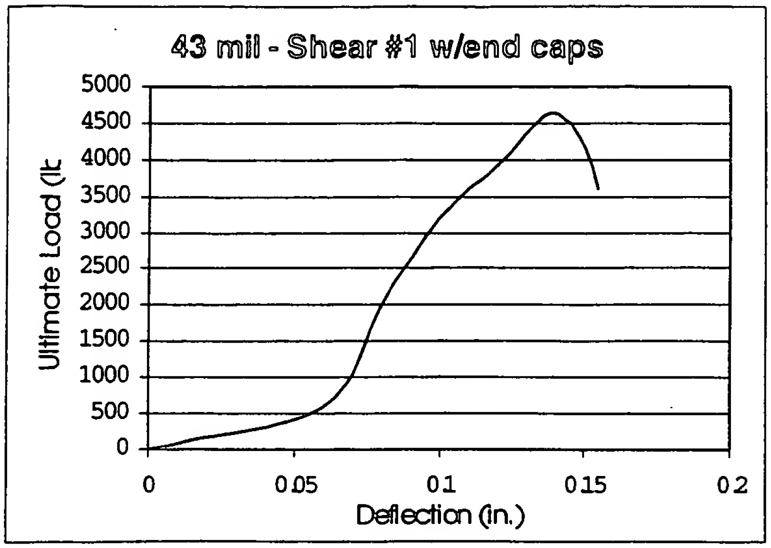
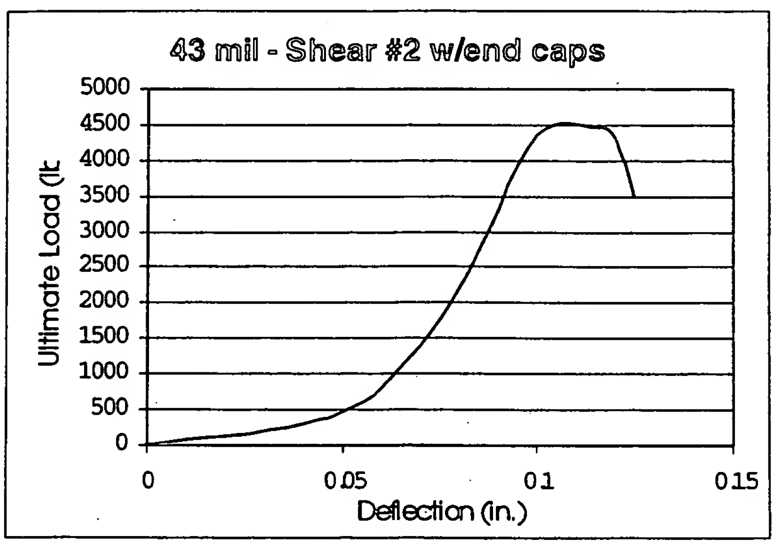
15 2' 18 GA



4632

16 2' 18 GA



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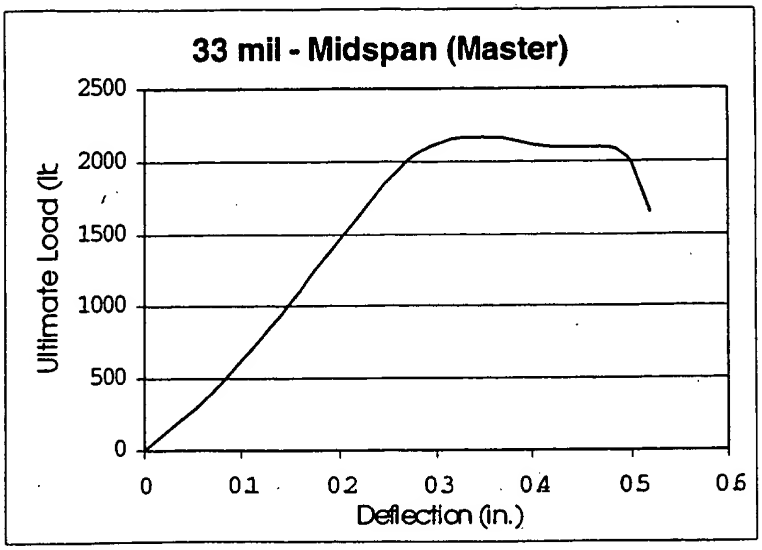
17

6' 20 GA



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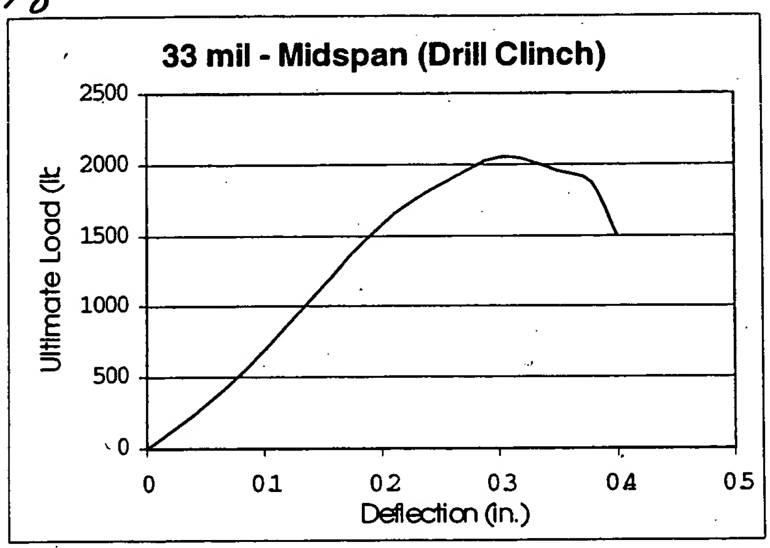
6' 20 GA



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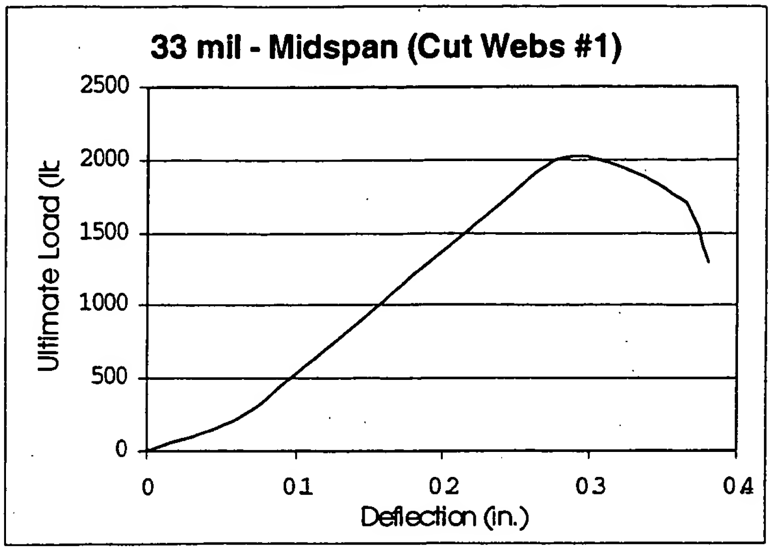

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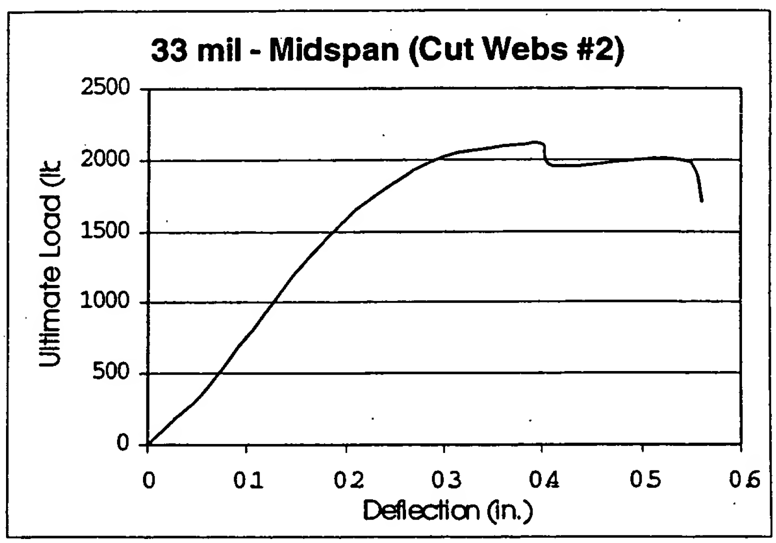
20

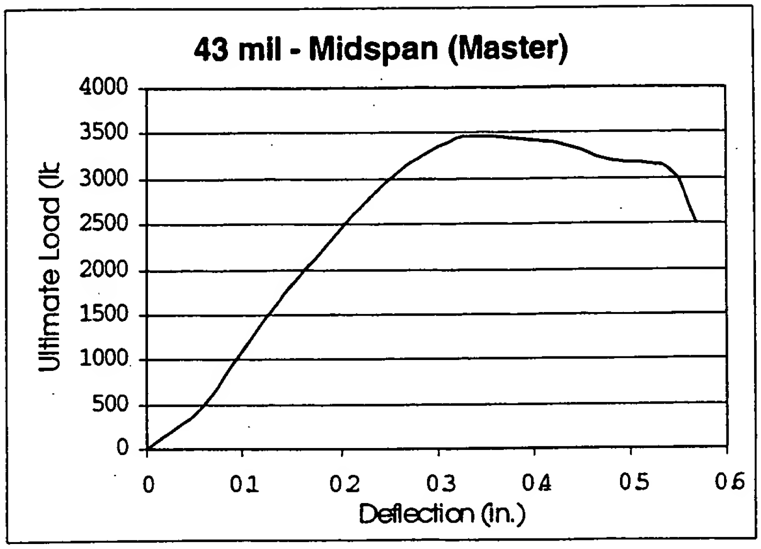
6' 20 GA



2105

21

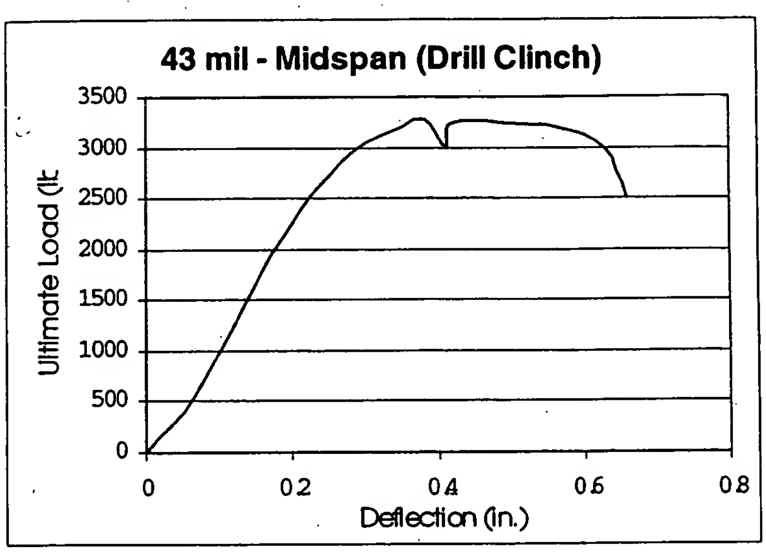
6' 18 GA



3468

22

6' 18 GA



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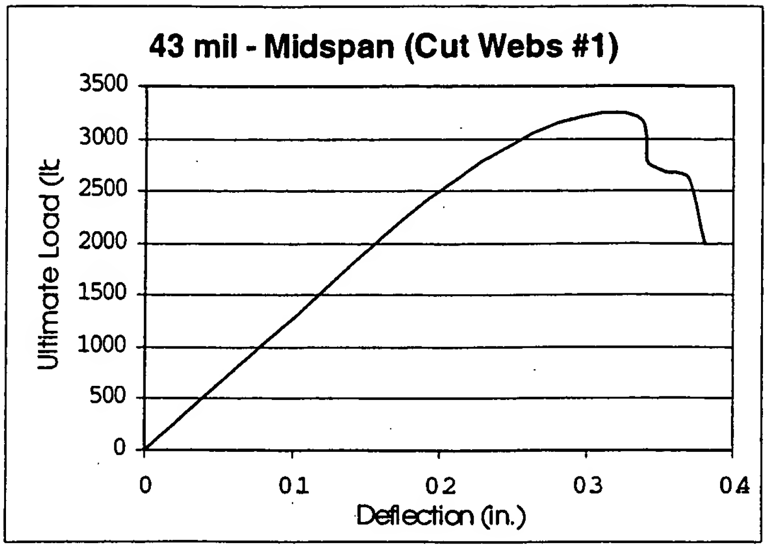
23

6' 18 GA



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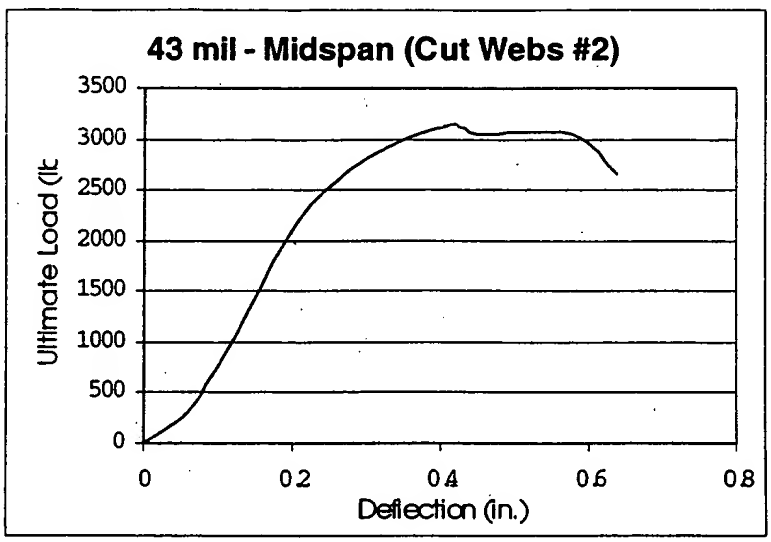
24

6' 18 GA



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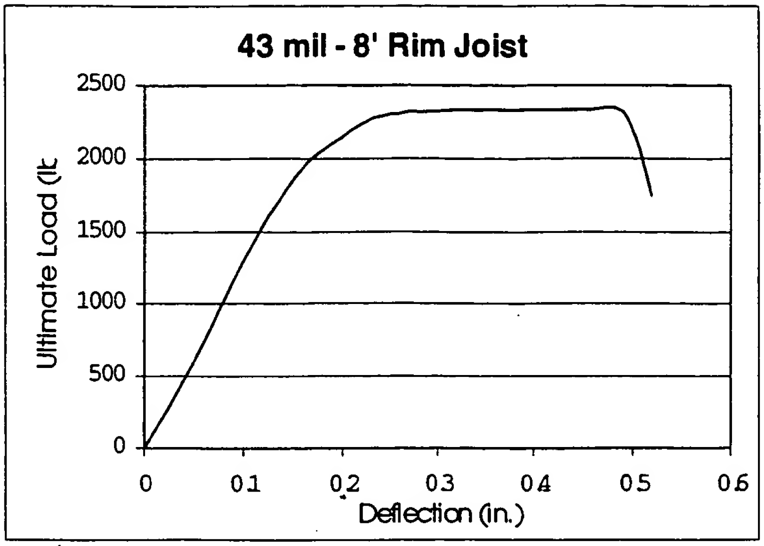
25

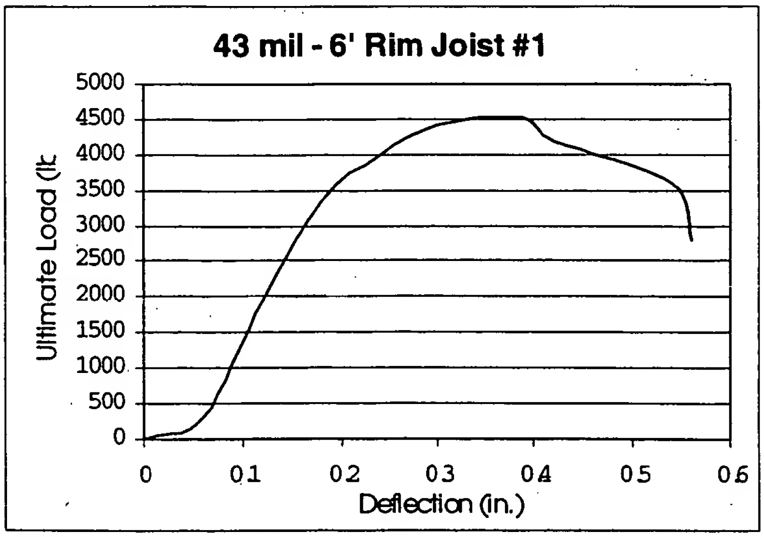
18GA 8'



2333

26

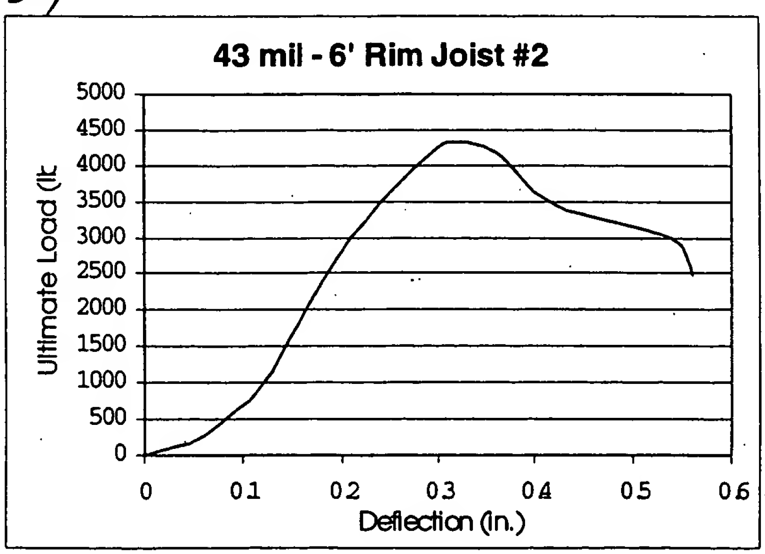
18GA 6'



4513

27

18 GA 6'



4338

APPENDIX E

METRIC CONVERSION

METRIC CONVERSION FACTORS

The following list provides the conversion relationship between U.S. customary units and the International System (SI) units. A complete guide to the SI system and its use can be found in ASTM E 380, Metric Practice.

To convert from	to	multiply by
Length		
inch (in.)	micrometer (µm)	25,400
inch (in.)	millimeter (mm)	25.4
inch (in.)	centimeter (cm)	2.54
inch (in.)	meter (m)	0.0254
foot (ft)	meter (m)	0.3048
yard (yd)	meter (m)	0.9144
mile (mi)	kilometer (km)	1.6
Area		
square foot (sq. ft)	square meter (sq. m)	0.0929
square inch (sq. in)	square centimeter (sq. cm)	6.452
square inch (sq. in.)	square meter (sq. m)	0.00064516
square yard (sq. yd)	square meter (sq. m)	0.8391
square mile (sq. mi)	square kilometer (sq. km)	2.6
Volume		
cubic inch (cu in.)	cubic centimeter (cu cm)	16.387064
cubic inch (cu in.)	cubic meter (cu m)	0.00001639
cubic foot (cu ft)	cubic meter (cu m)	0.02831685
cubic yard (cu yd)	cubic meter (cu m)	0.7645549
gallon (gal) Can. liquid	liter	4.546
gallon (gal) Can. liquid	cubic meter (cu m)	0.004546
gallon (gal) U.S. liquid*	liter	3.7854118
gallon (gal) U.S. liquid	cubic meter (cu m)	0.00378541
fluid ounce (fl oz)	milliliters (ml)	29.57353
fluid ounce (fl oz)	cubic meter (cu m)	0.00002957
Force		
kip (1000 lb.)	kilogram (kg)	453.6
kip (1000 lb.)	Newton (N)	4,448.222
pound (lb.)	kilogram (kg)	0.4535924
pound (lb.)	Newton (N)	4.448222
Stress or pressure		
kip/sq. inch (ksi)	megapascal (Mpa)	6.894757
kip/sq. inch (ksi)	kilogram/square centimeter (kg/sq. cm)	70.31
pound/sq. inch (psi)	kilogram/square centimeter (kg/sq. cm)	0.07031
pound/sq. inch (psi)	pascal (Pa) **	6,894.757
pound/sq. inch (psi)	megapascal (Mpa)	0.00689476
pound/sq. foot (psf)	kilogram/square meter (kg/sq. m)	4.8824
pound/sq. foot (psf)	pascal (Pa)	47.88

To convert from	to	multiply By
Mass (weight)		
pound (lb.) avoirdupois	kilogram (kg)	0.4535924
ton, 2000 lb.	kilogram (kg)	907.1848
grain	kilogram (kg)	0.0000648
Mass (weight) per length)		
kip per linear foot (klf)	kilogram per meter (kg/m)	0.001488
pound per linear foot (plf)	kilogram per meter (kg/m)	1.488
Moment		
1 foot-pound (ft-lb.)	Newton-meter (N-m)	1.356
Mass per volume (density)		
pound per cubic foot (pcf)	kilogram per cubic meter (kg/cu m)	16.01846
pound per cubic yard (lb/cu yd)	kilogram per cubic meter (kg/cu m)	0.5933
Velocity		
mile per hour (mph)	kilometer per hour (km/hr)	1.60934
mile per hour (mph)	kilometer per second (km/sec)	0.44704
Temperature		
degree Fahrenheit (°F)	degree Celsius (°C)	$t_C = (t_F - 32)/1.8$
degree Fahrenheit (°F)	degree Kelvin (°K)	$t_K = (t_F + 59.7)/1.8$
degree Kelvin (°F)	degree Celsius (°C)	$t_C = (t_K - 32)/1.8$

* One U.S. gallon equals 0.8327 Canadian gallon
** A pascal equals 1000 Newton per square meter.

The prefixes and symbols below are commonly used to form names and symbols of the decimal multiples and submultiples of the SI units.

Multiplication Factor	Prefix	Symbol
$1,000,000,000 = 10^9$	giga	G
$1,000,000 = 10^6$	mega	M
$1,000 = 10^3$	kilo	k
$0.01 = 10^{-2}$	centi	c
$0.001 = 10^{-3}$	milli	m
$0.000001 = 10^{-6}$	micro	µ
$0.000000001 = 10^{-9}$	nano	n

NAHB RESEARCH CENTER

America's Housing Technology and Information Resource

June 16, 1999

Mr. Ken Vought
USS/POSCO
900 Loveridge Road
Pittsburg, CA 94565

Dear Ken:

Attached please find two copies of the final report titled "*Structural Evaluation of Steelworks' SteelJoist*". We have now completed the deliverables for this project.

This has been a very active and successful project and I would like to especially thank you for your continued interest and guidance. This letter serves as our notice of final completion of the job.

The NAHB Research Center is available to assist or work with USS/POSCO to develop efficient and cost effective solutions for cold-formed steel framing and to increase steel framing market share, especially in the residential and light commercial construction markets. I am looking forward to more successful projects in the near future. Meanwhile, if you have any questions, or if I can be of further assistance, please do not hesitate to contact me directly at (800) 638-8556 ext. 581.

Sincerely,

Nader Elhajj

Nader Elhajj
Project Manager

cc: Darrell Meyer (SteelWorks)

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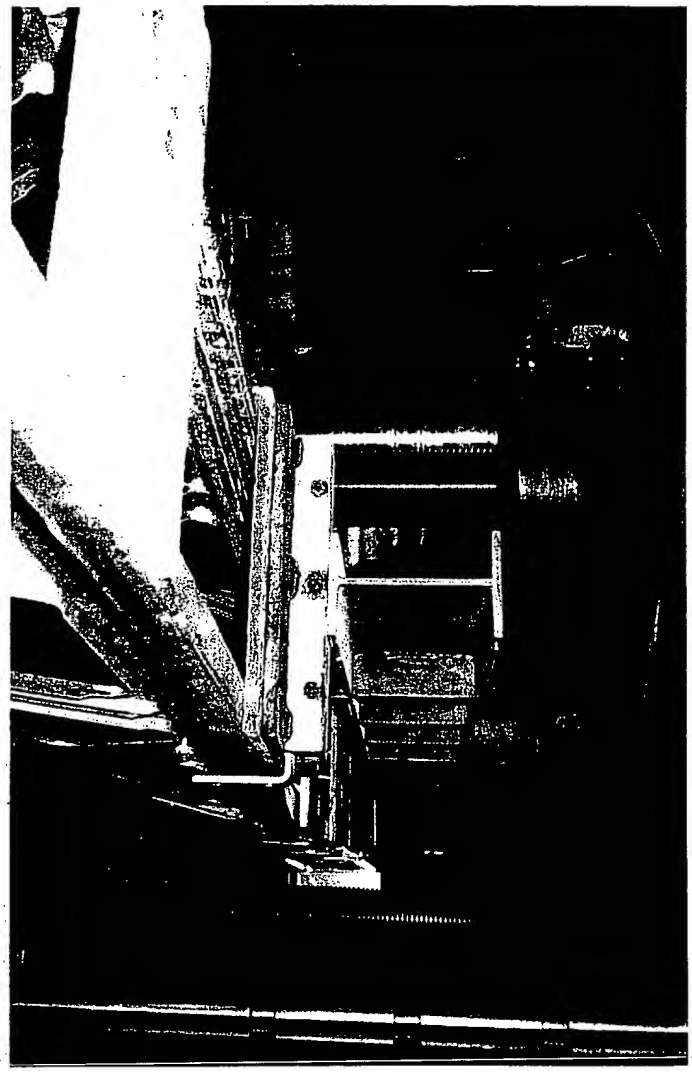
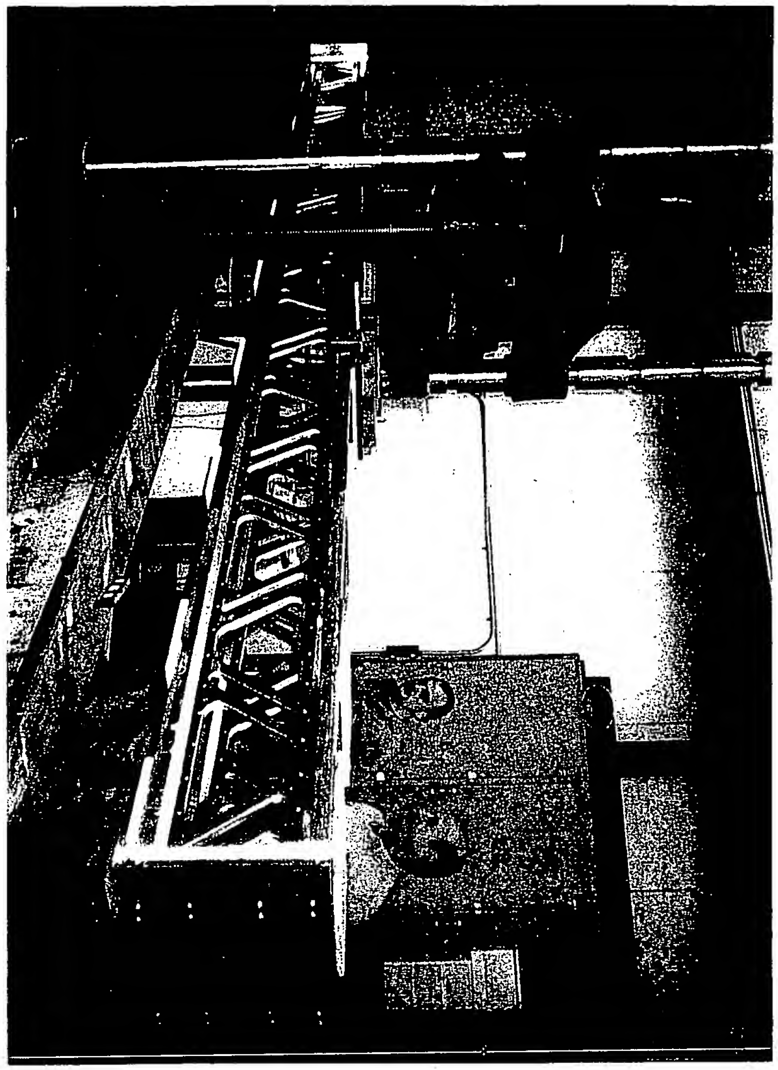
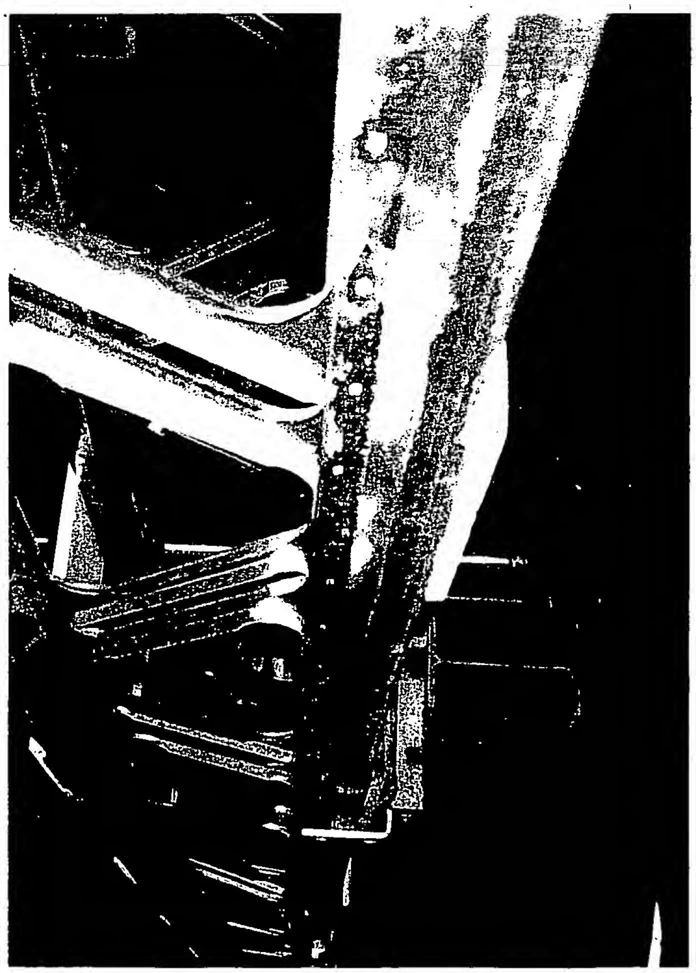
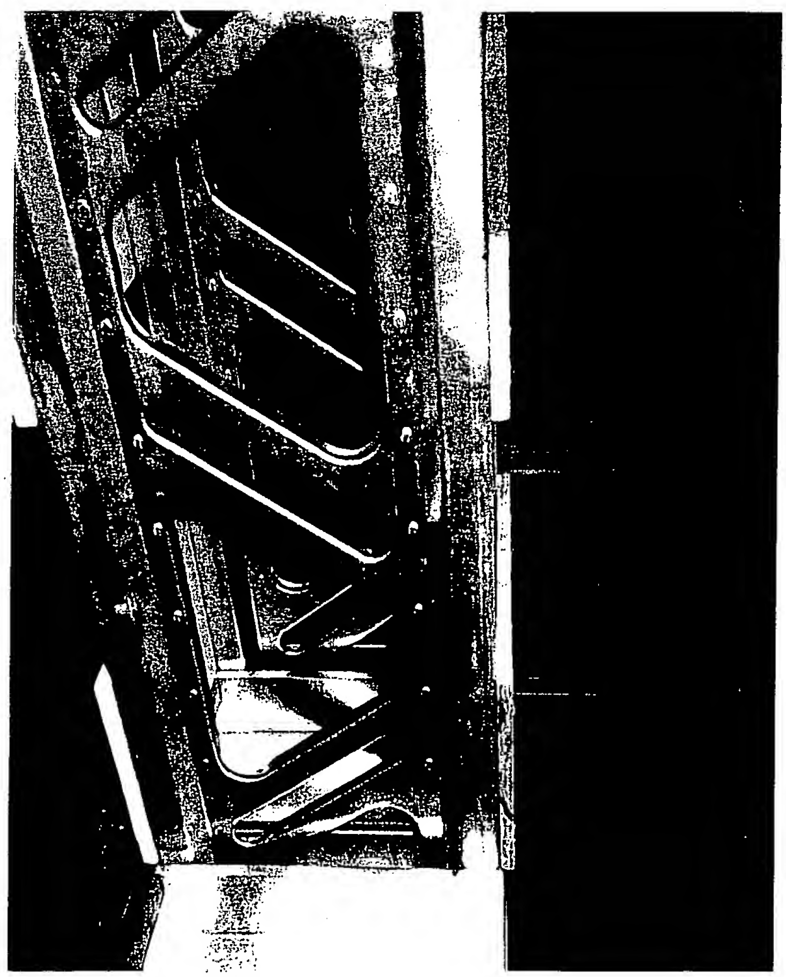
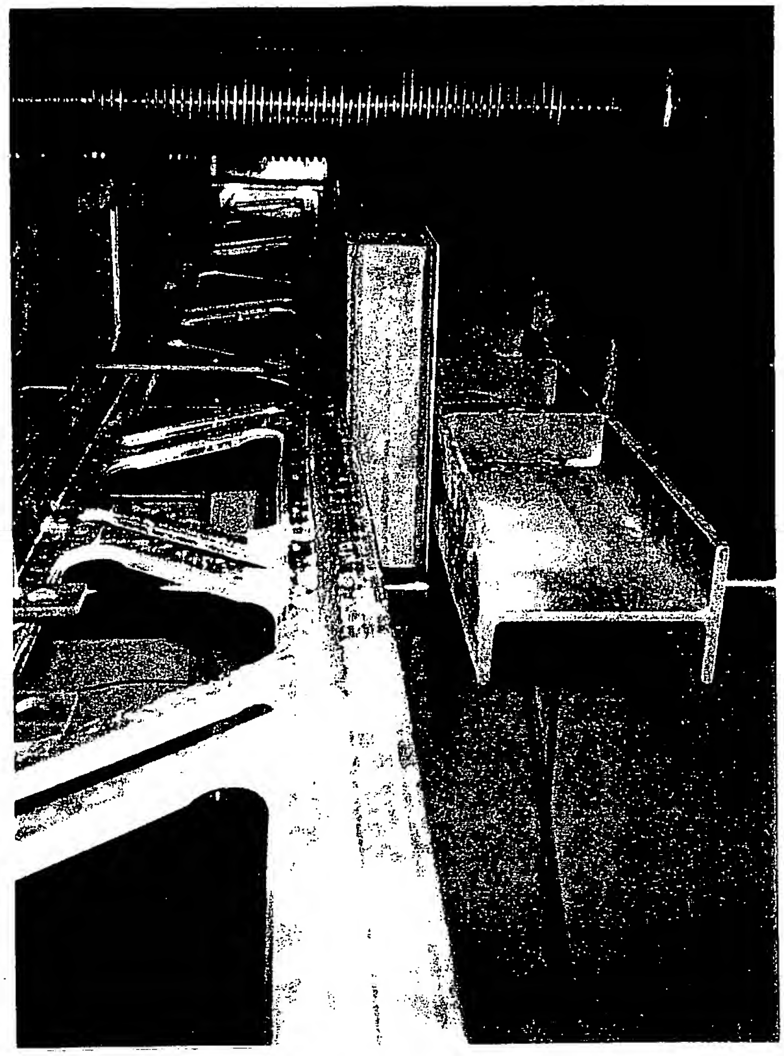
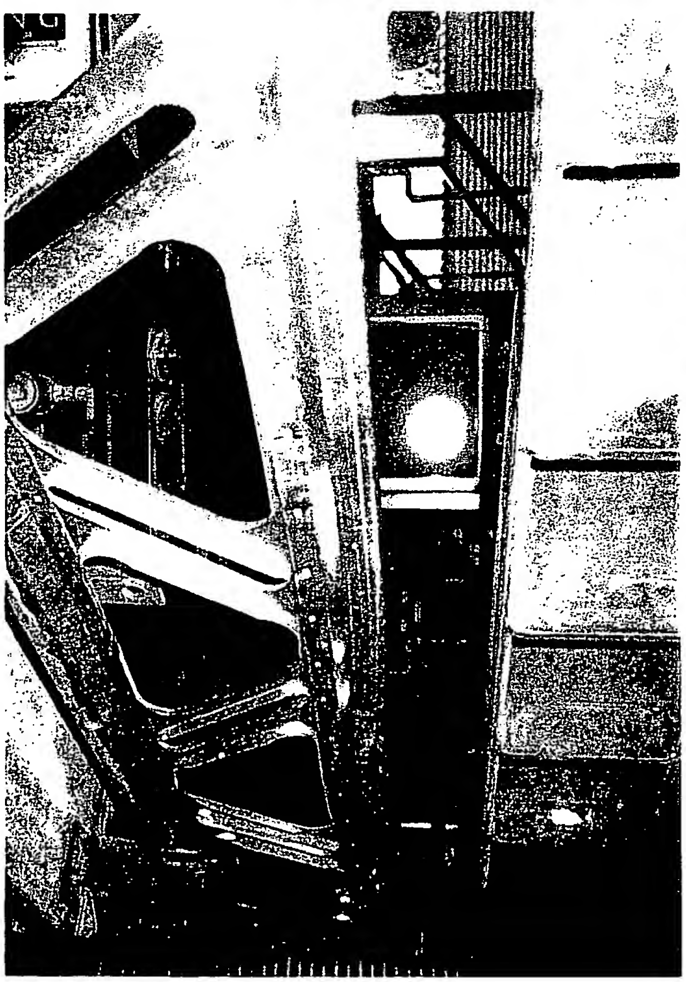
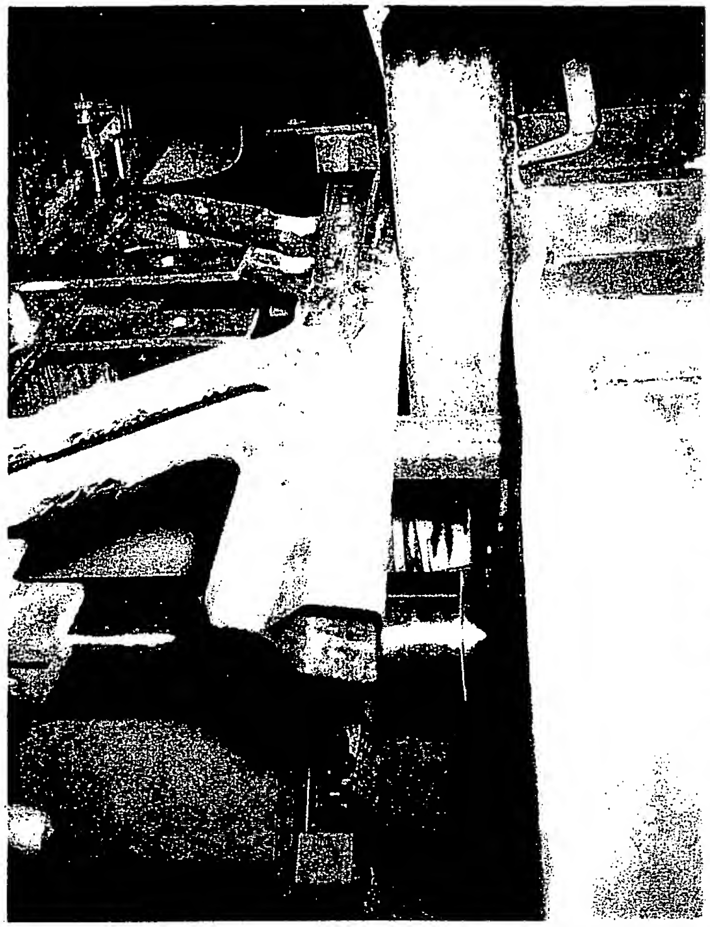
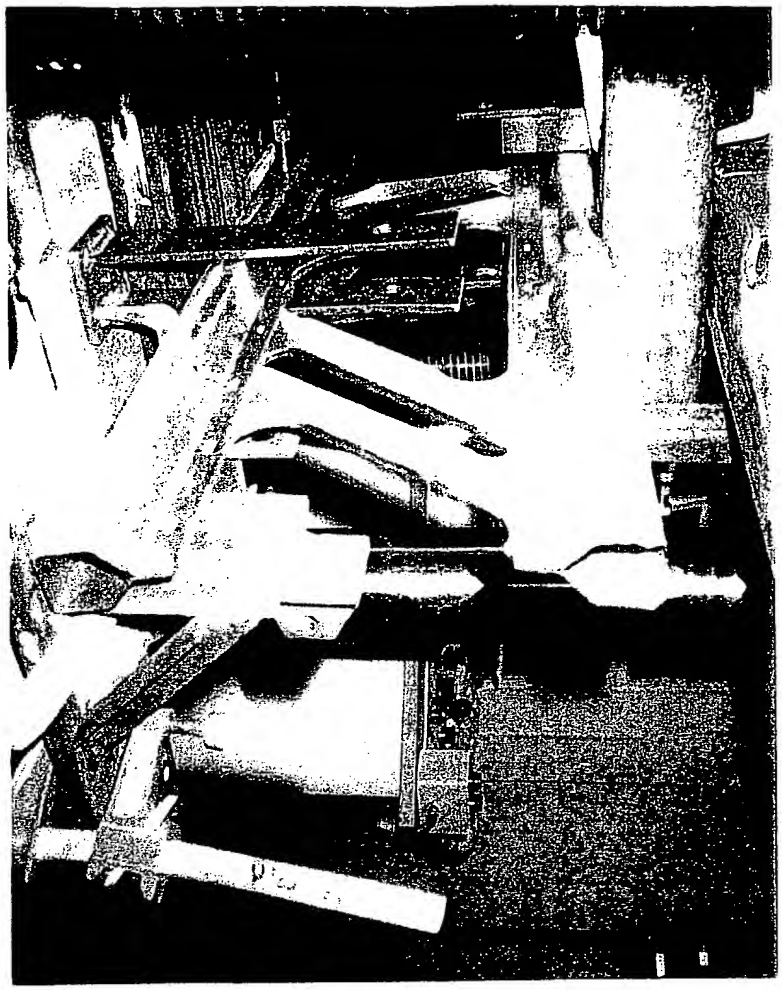
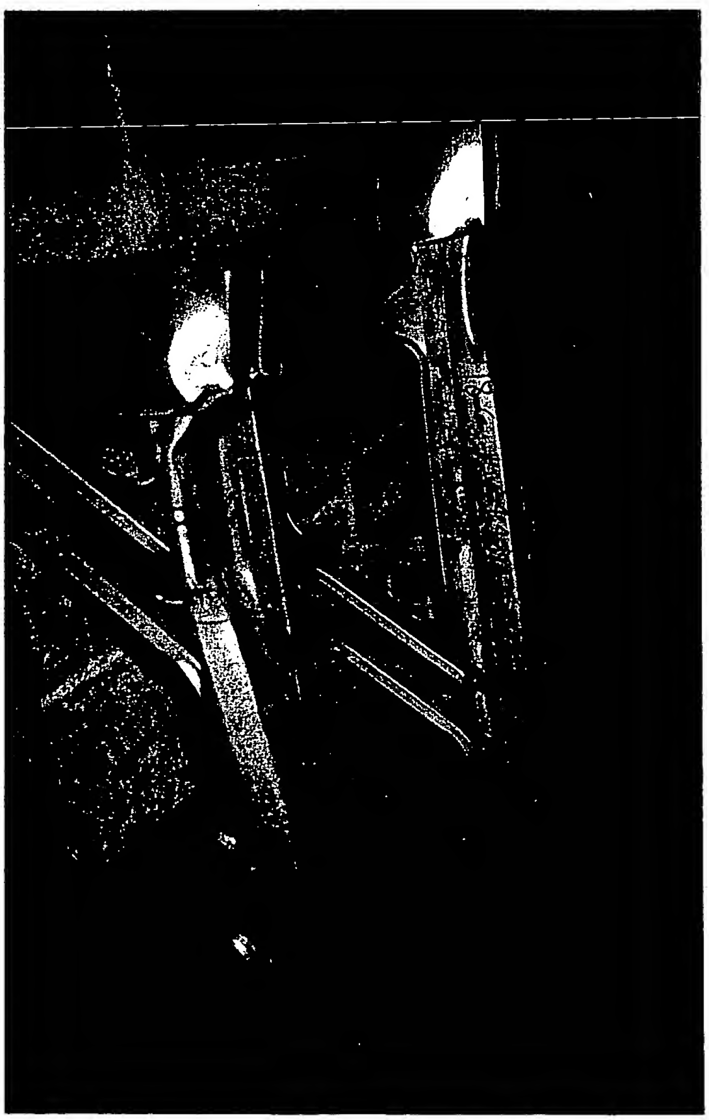
400 Prince George's Boulevard · Upper Marlboro, Maryland · 20774-8731
301-249-4000 · *fax* 301-249-0305 · http://www.nahbrc.org

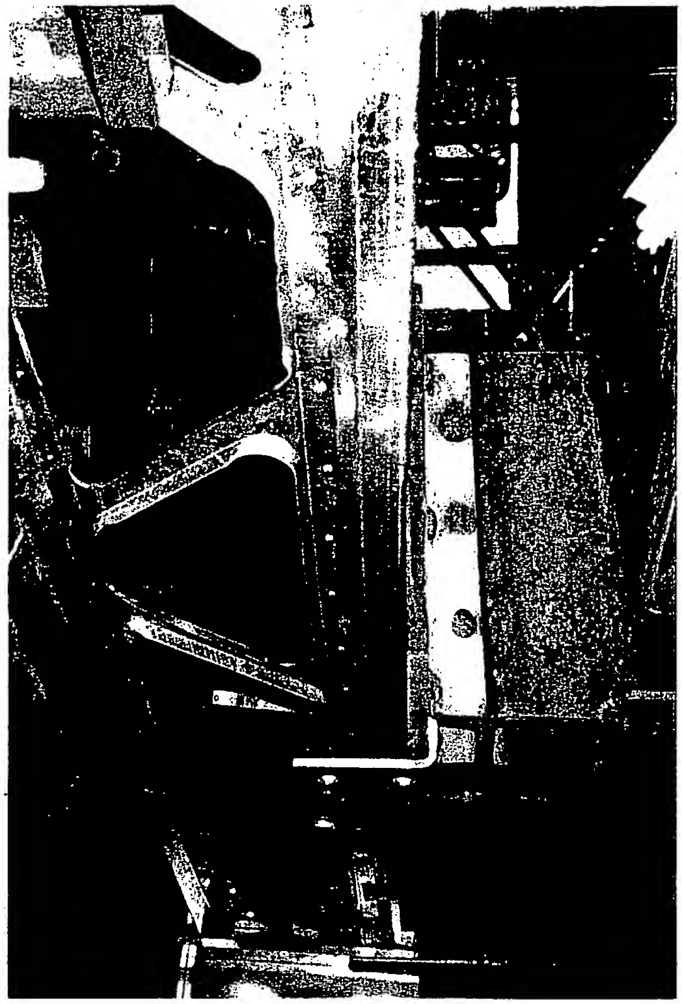





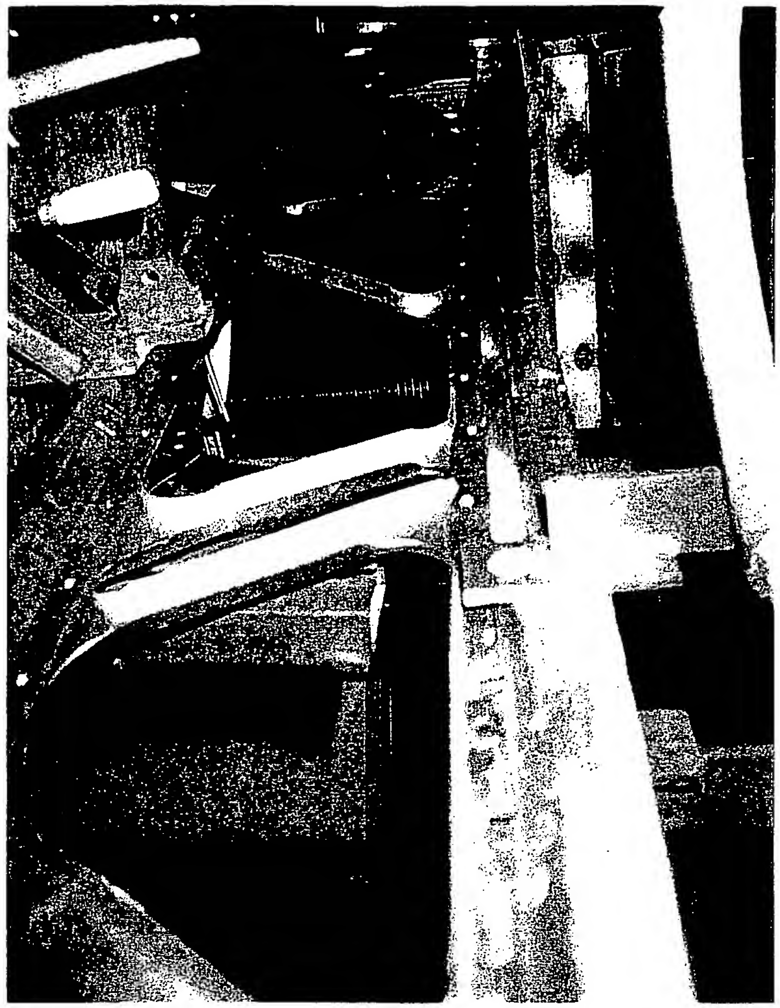


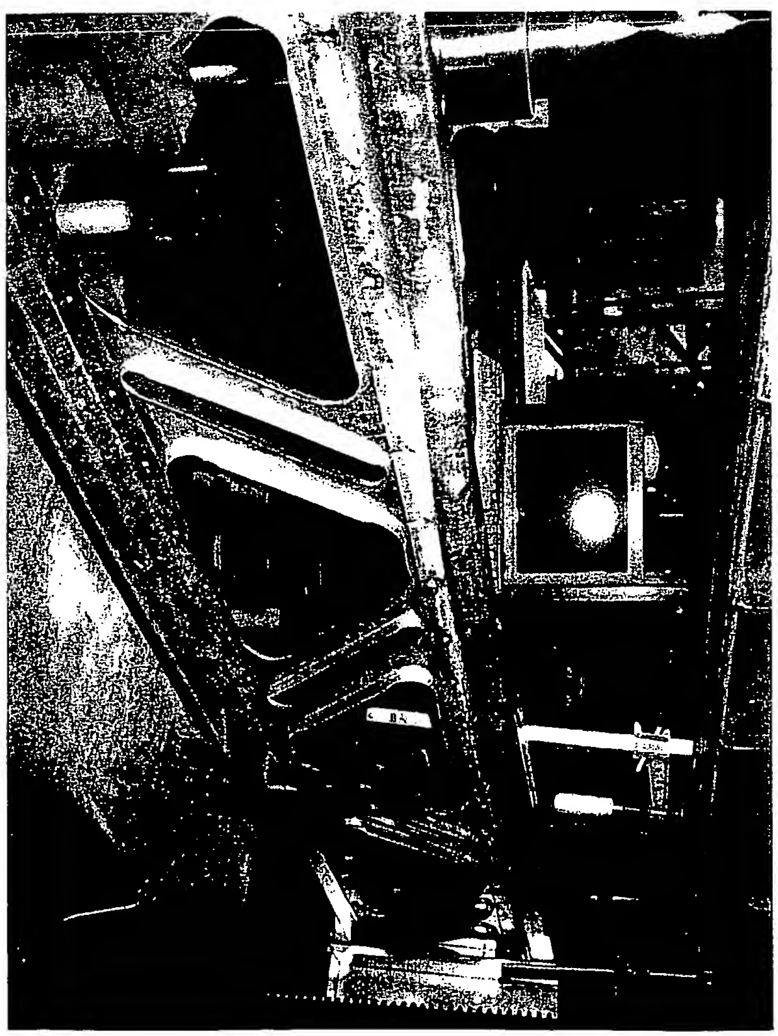


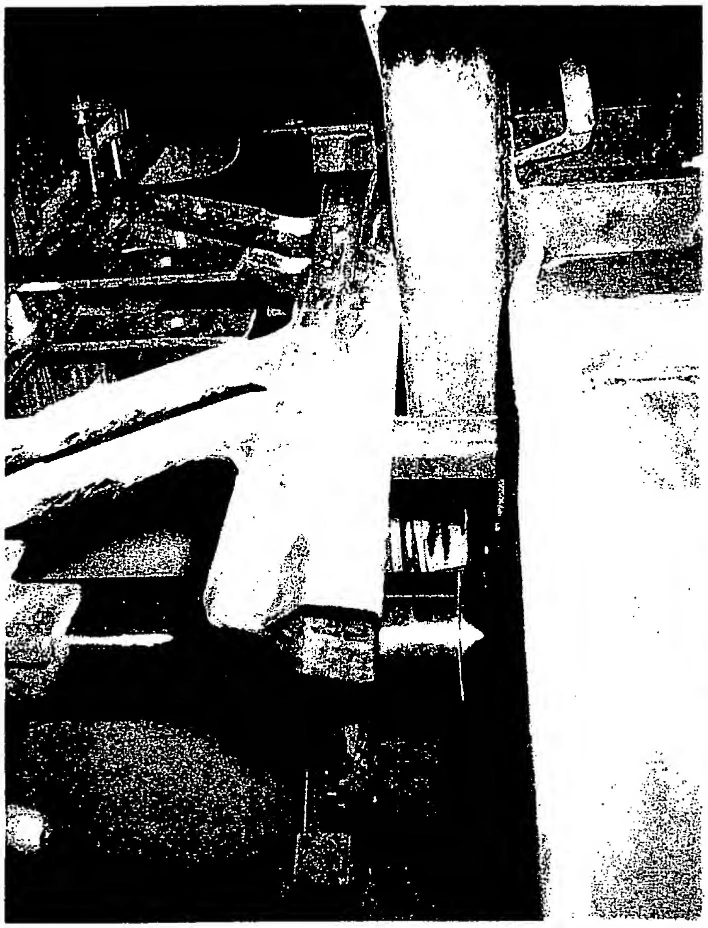
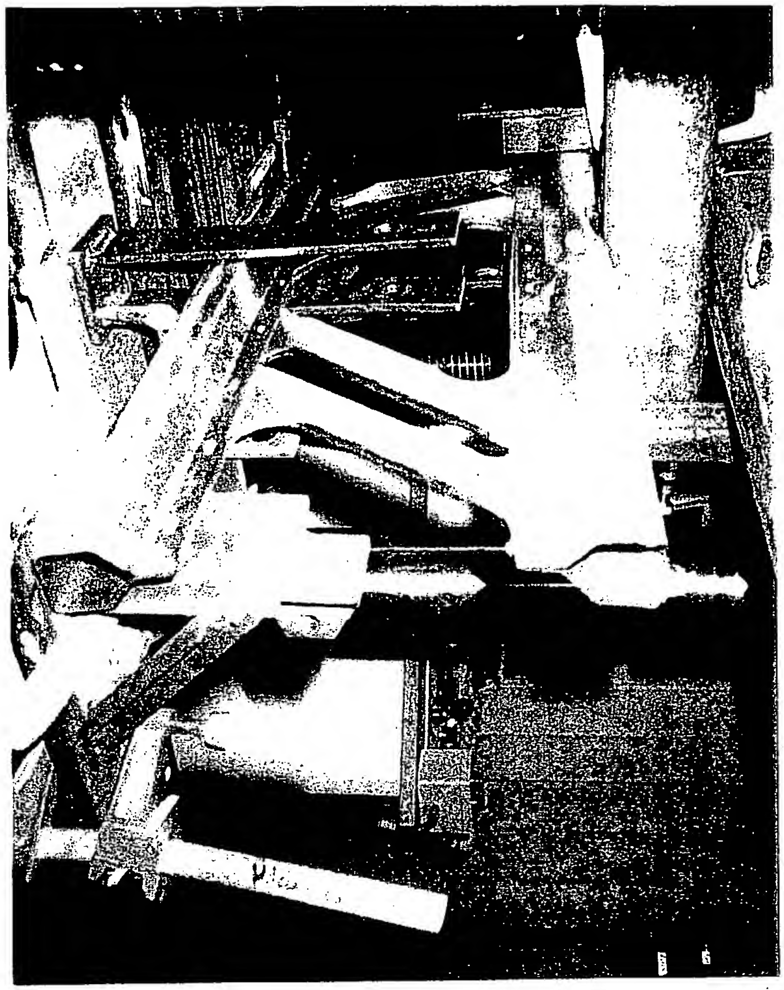




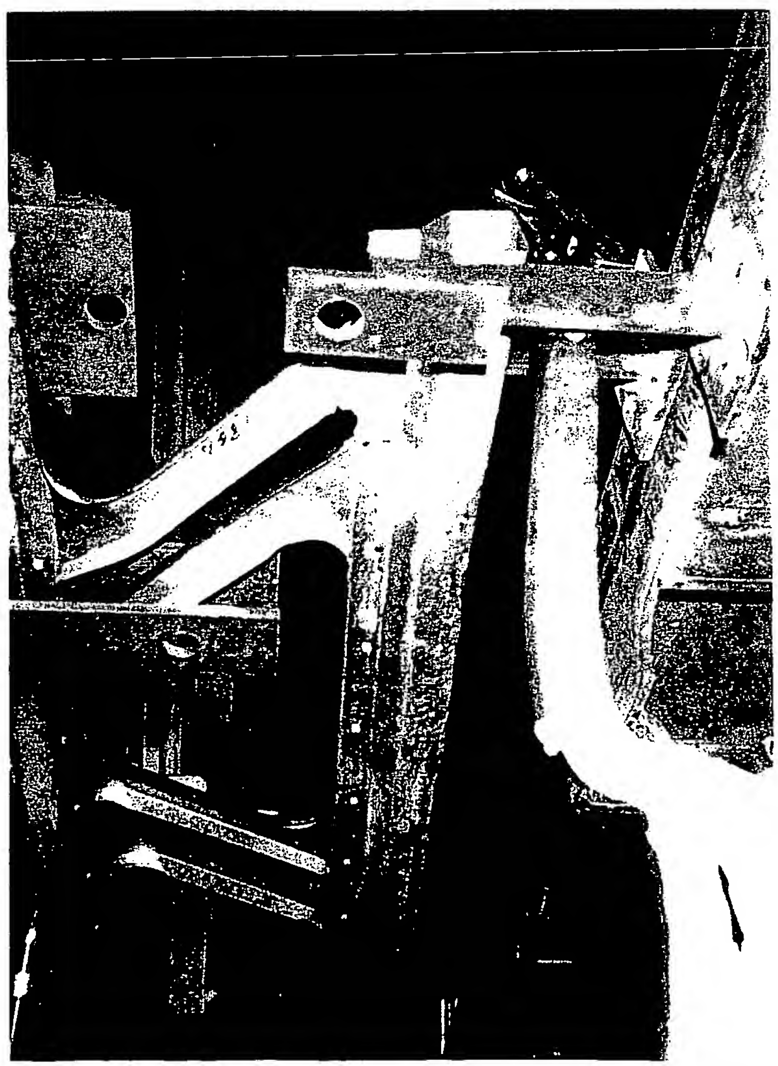

9










11,100
19,183

NAHB
RESEARCH
CENTER

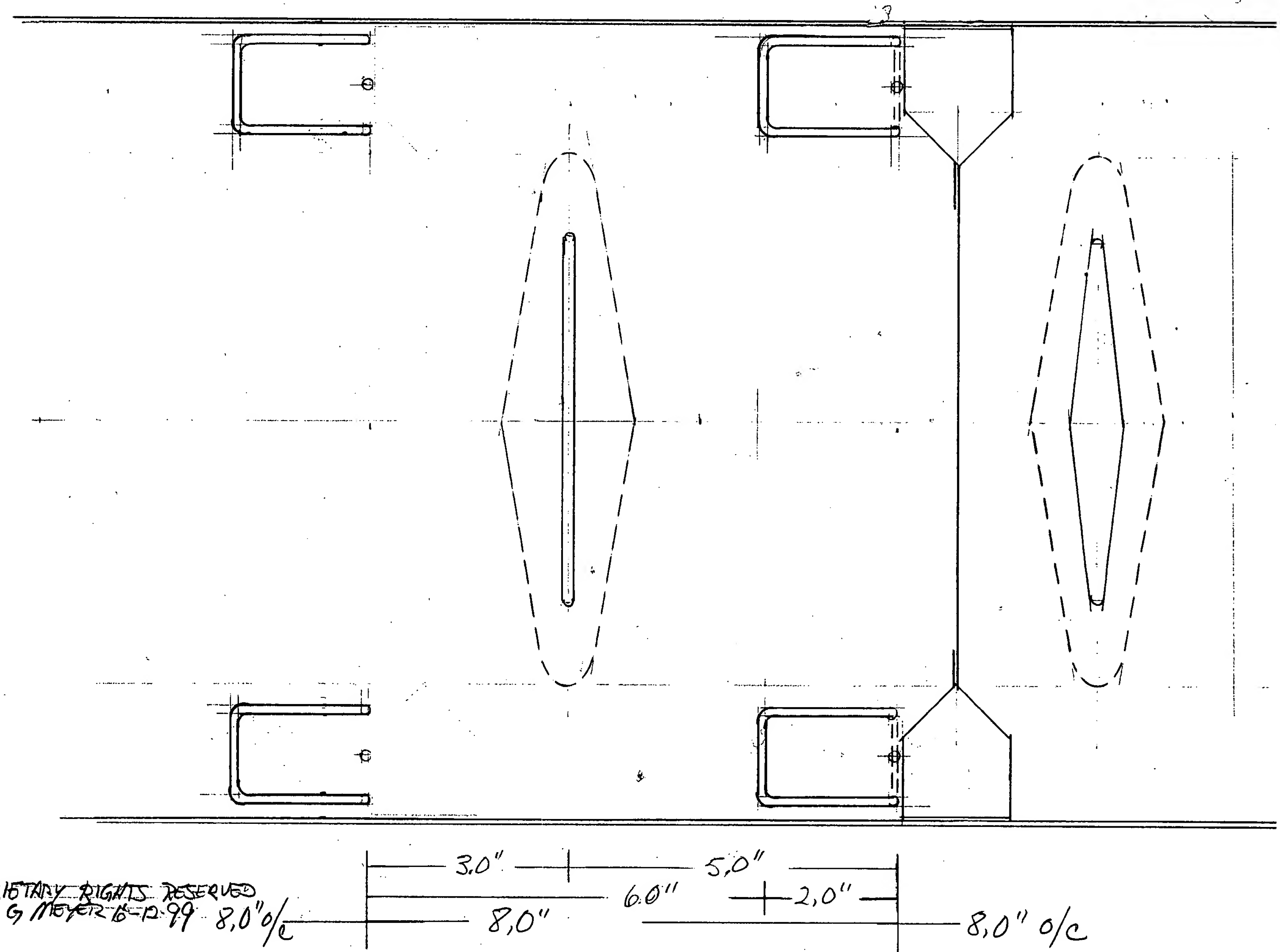
400 Prince George's Boulevard
Upper Marlboro, Maryland 20774-8731
301-249-4000 *fax* 301-249-0305
http://www.nahbrc.org

exhibit 42

STEEL I JOIST RIM BAND

CUT LINE

156



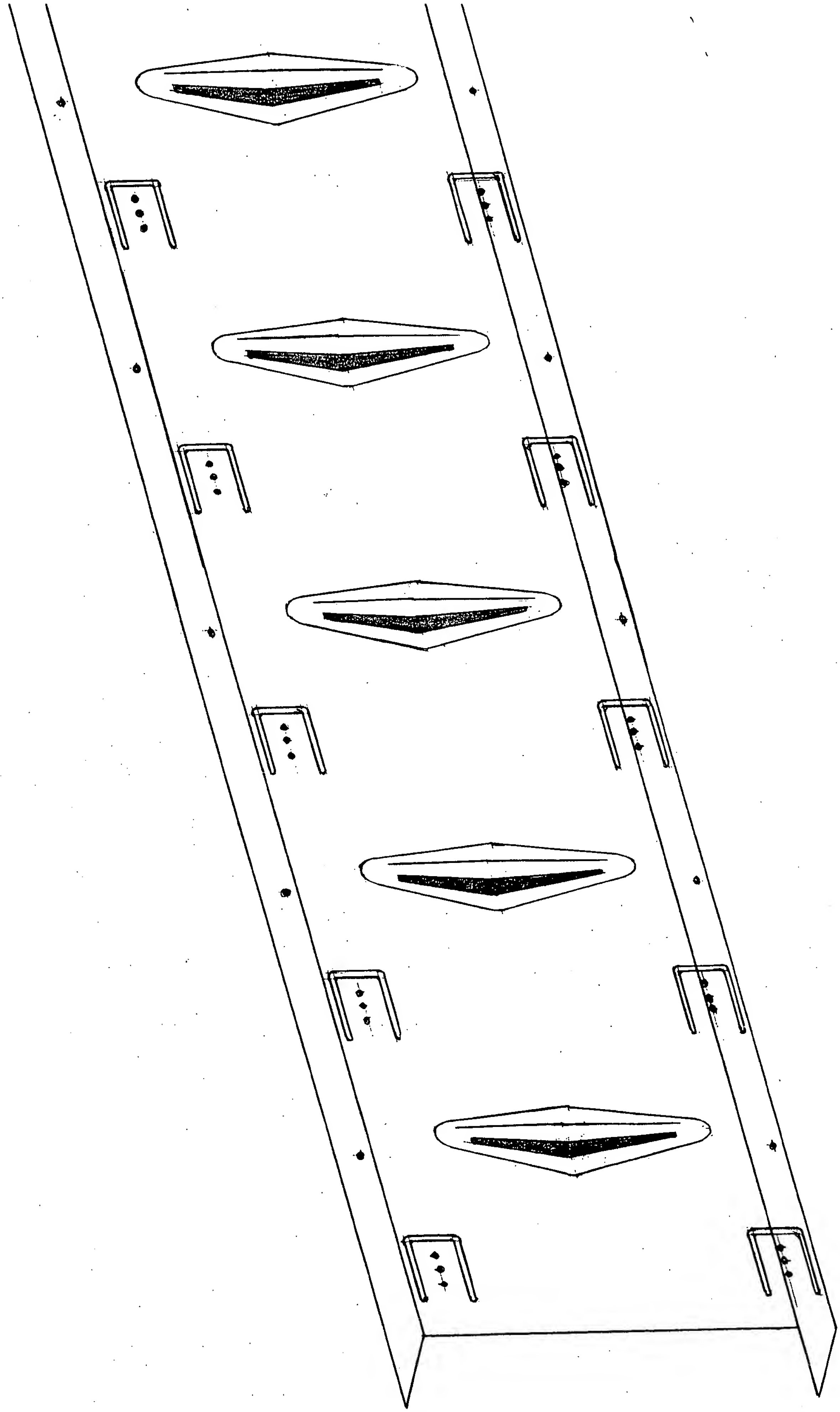


exhibit 43

BOB FISH TUES 7-30-96

1. OPTION TO PURCHASE RIGHTS - SEPARATE

a. TRUSS JOIST 75,000 + ,02¢ FT

b. ROOF TRUSS CHORD 100,000 ,03¢ FT
GUS TRUSS

2) DO I REMAIN INDEPENDANT / INDIVIDUAL?

RESIDENCE - STATE - (NEV OR CAL)

3) R & D CO.

a. THEY PROVIDE CAPITOL

b. I RETAIN P. RIGHTS? OWN BY CO?

c. OPTION TO BUY BACK COMPANY?

d.

ABSTRACT

BACKGROUND OF THE INVENTION

SUMMARY OF INVENTION

DESCRIPTION OF DRAWINGS

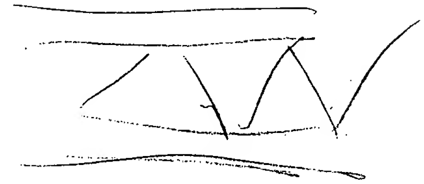
DETAILED DESCRIPTION

DESCRIPTION OF DRAWINGS

2. ~~1.~~ END VIEW
FIGURE 1

1. ~~2.~~ ~~END~~ SIDE VIEW

DESCRIBE ANGLES
FLANGES



3. PERSPECTIVE

4. END CAP A PLAN

B WITH FLANGES - BOT

5. RIM JOIST - 12" TRACK

6. FLAT SHEAR - 16" SHEET

3778946

6

MICRO

CLASSIFICATION DEFINITIONS

52-66 223.8 BEAM, GIRDER, OR TRUSS CONSTRUCTION:
PRELOADED STRUCTURE UNDER SUB-CLASS 223.1 WHICH IS A DISTINCT GENERALLY HORIZONTAL STRUCTURAL MEMBER STRENGTHENED ALONG A MAJOR OR MINOR AXIS TO COUNTERACT FORCES FROM ADDITIONAL LOADS (E.G. FLOOR, ROOF

52-66 223.9 COMPOSED OF ABUTTING SECTIONS:
BEAM, GIRDER OR TRUSS UNDER SUBCLASS 223 WHICH IS MADE UP OF A PLURALITY OF PREFORMED SECTIONS.

52-65 223.12 HOMOGENOUS DESIGN (E.G. ALL METAL)
BEAM, GIRDER OR TRUSS UNDER SUBCLASS 223.. IN WHICH THE STRUCTURAL ELEMENT INCLUDING THE PRESTRESSING MEANS IS FABRICATED FROM A SINGLE MATERIAL (E.G. STEEL)

52-126 634 STRUCTURE UNDER SUBCLASS 633 IN WHICH THE ELONGATED RIGID STRUCTURE HAS PARTS ACTING AS ELONGATED RUNNERS (CHORDS) AND CROSS MEMBERS (STRUTS) WITH THE STRUTS BEING INTEGRAL WITH A CHORD.

✓ PRINT-OUT OF PATENT NOS.

MILD
52-145

729.1 I BEAM
STRUCTURE UNDER SUBCLASS 720.1 INCLUDING AT LEAST 2 FLANGE MEMBERS JOINED BY A WEB MEMBER, WHICH PROVIDE A CROSS-SECTION OF THE SHAFT IN THE SHAPE OF AN I OR H

CLASS 52 STATIC STRUCTURES (E.G. BUILDINGS

	CLASSIFICATION DEFINITIO.
BEAM, GIRDER OR TRUSS CONSTRUCTION	223.8
I BEAM	729.1
~~CORRUGATED WEB~~	~~729.3~~
~~WOODEN COMPONENT~~	~~740.8~~
~~FOLDED SHEET MATERIAL~~	~~741.1~~
* TRUSS WITH UNITARY CHORD & WEB	634
E.G. SHEET METAL	*
* CONTINUOUS SERPENTINE; E.G. WARREN TRUSS	694

TRUSS WITH UNITARY CHORD & WEB	634	
WEBB PORTIONS CONNECTED BETWEEN CHORDS	636	
BEAM E.G. GIRDER, JOIST, ETC	650.1	
HOMOGENOUS DESIGN (EG ALL METAL)	223.12	YES
BEAM, GIRDER OR TRUSS CONSTRUCTION	223.8	YES

HISTORY

JOIST JOISTeel

A JOIST IS A HORIZONTAL STRUCTURAL MEMBER TO SUPPORT A FLOOR OR A ROOF.

CONVENTIONAL WOOD FRAME CONSTRUCTION UTILIZES SOLID SAWN LUMBER, I.E. 2"X8" TO 2"X14" IN SIZE. THESE MEMBERS ARE TYPICALLY AVAILABLE UP TO 20 FT. LENGTHS, ARE HEAVY, ALLOW ONLY MINOR DRILLING FOR ELECTRICAL AND QUALITY IS DIMENINISHING DUE LACK OF OLD GROWTH TIMBER

FABRICATED WOOD JOISTS CALLED T.J.I.S (TRUSS JOIST I BEAM) ARE MANUFACTURED UTILIZING SOLID OR LAMINATED TOP & BOTTOM CHORDS AND AN INTERMEDIATE SHEET OF PLYWOOD, GLUED BETWEEN THEM, AS A WEB. THESE ARE AVAILABLE IN LONG LENGTHS, VARIOUS HEIGHTS AND ARE A POPULAR CHOICE. THEY ARE LIMITED IN CERTAIN APPLICATIONS AS THEY MAY NOT BE DRILLED OR NOTCHED NEAR THEIR ENDS

FABRICATED OPEN WEB JOISTS ARE MANUFACTURED UTILIZING SOLID OR LAMINATED TOP AND BOTTOM CHORDS AND EITHER WOOD OR METAL WEBS.

CLASS / SUBCLASS

CLASS 52 STATIC STRUCTURES (E.G. BUILDINGS)

Class : 52/634

DAN DPY / STUDOO

5463837 Metal roof truss
52/639 52/92.2 52/634 52/690 52/731.9

~~4869040~~ FRAMING SYSTEM
52/633 52/634

4793113 Wall system and metal stud therefor
52/481.1 52/634 52/636 52/733.2 D25/119 D25/132

4490958 SHEET METAL BEAM
52/634 52/729.3 52/729.5 52/731.7

~~4385476~~ WEB STIFFENER FOR LIGHT-GAUGE METAL FRAMING MEMBERS
52/739.1 52/634

4329824 SHEET METAL BEAM
52/634 52/729.3 52/731.7 52/737.6

~~4228631~~ HOLLOW RECTANGULAR JOIST
52/690 52/634 52/693 52/730.7

~~4030256~~ BUILDING CONSTRUCTION
52/93.1 52/634 52/643 52/694 D25/61 D25/132

~~3845594~~ STEEL JOIST OR COMPOSITE STEEL AND CONCRETE CONSTRUCTION
52/98 52/334 52/634 52/690 52/729.5

~~3785108~~ ROOF TRUSSES
52/645 52/634 52/640 52/641 52/650.2

SUB-CLASS 634

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NOT RELEVANTE

4,435,940 (ANGLES) 3/1984 DAVENPORT ET AL